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SAR TEST REPORT





The following samples were submitted and identified on behalf of the client as:

Equipment Under Test Notebook Computer

HP **Brand Name**

Model No. HSN-I13C-4

Company Name HP Inc.

Company Address 3390 East Harmony Road Fort Collins, Colorado 80528

United States

Standards IEEE/ANSI C95.1-1992,IEEE 1528-2013,

> KDB248227D01v02r02, KDB865664D01v01r04, KDB447498D01v06, KDB616217D04v01r02,

KDB865664D02v01r02

FCC ID TX2-RTL8822BE

Date of Receipt Oct. 16, 2017

Date of Test(s) Oct. 24, 2017 ~ Jun. 15, 2018

Date of Issue Jun. 28, 2018

In the configuration tested, the EUT complied with the standards specified above.

Remarks:

This report details the results of the testing carried out on one sample, the results contained in this test report do not relate to other samples of the same product. The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report.

This report may only be reproduced and distributed in full. If the product in this report is used in any configuration other than that detailed in the report, the manufacturer must ensure the new system complies with all relevant standards. Any mention of SGS Taiwan Electronic & Communication Laboratory or testing done by SGS Taiwan Electronic & Communication Laboratory in connection with distribution or use of the product described in this report must be approved by SGS Taiwan Electronic & Communication Laboratory in writing.

Signed on behalf of SGS

| Clerk / Annie Chang | Asst. Supervisor / Afu Chen | Asst. Manager / John Yeh |
|---------------------|-----------------------------|--------------------------|
| Annie Charg | afor Chen | John Teh |
| | | Date: Jun. 28, 2018 |

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Revision History

| Report Number | Revision | Description | Issue Date |
|-------------------|----------|------------------------------|---------------|
| E5/2017/A0031A-01 | Rev.00 | Initial creation of document | Jun. 21, 2018 |
| E5/2017/A0031A-01 | Rev.01 | 1 st modification | Jun. 28, 2018 |
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Member of SGS Group



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1. General Information

1.1 Testing Laboratory

| SGS Taiwan Ltd. Electronics & Communication Laboratory | | | | | |
|--|---|--|--|--|--|
| 1F, No. 8, Alley 15, L | ane 120, Sec. 1, NeiHu Road, Neihu District, Taipei City, | | | | |
| 11493, Taiwan. | | | | | |
| Tel | +886-2-2299-3279 | | | | |
| Fax | +886-2-2298-0488 | | | | |
| Internet | http://www.tw.sgs.com/ | | | | |

1.2 Details of Applicant

| Company Name | HP Inc. |
|-------------------|---|
| II AMNANY AAATAee | 3390 East Harmony Road Fort Collins, Colorado 80528 United States |

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1.3 Description of EUT

| Equipment Under Test | Notebook Computer | | | | | | |
|--------------------------|---|------------|-------|------|--|--|--|
| Brand Name | HP | | | | | | |
| Model No. | HSN-I13C-4 | HSN-I13C-4 | | | | | |
| FCC ID | TX2-RTL8822BE | | | | | | |
| Mode of Operation | ⊠WLAN802.11 a/b/g/n(20M/40M)/ac(⊠Bluetooth | 20M/40 |)M/80 | M) | | | |
| Duty Cycle | WLAN802.11 a/b/g/n(20M/40M)/ ac(20M/40M/80M) | | 1 | | | | |
| | Bluetooth | | 1 | | | | |
| | WLAN802.11 b/g/n(20M) | 2412 | _ | 2462 | | | |
| | WLAN802.11 n(40M) | 2422 | _ | 2452 | | | |
| | WLAN802.11 a/n(20M)/ac(20M) 5.2G | 5180 | _ | 5240 | | | |
| | WLAN802.11 n(40M)/ac(40M) 5.2G | 5190 | _ | 5230 | | | |
| | WLAN802.11 ac(80M) 5.2G | 5210 | | | | | |
| | WLAN802.11 a/n(20M)/ac(20M) 5.3G | 5260 | _ | 5320 | | | |
| | WLAN802.11 n(40M)/ac(40M) 5.3G | 5270 | _ | 5310 | | | |
| TX Frequency Range (MHz) | WLAN802.11 ac(80M) 5.3G | 5290 | | | | | |
| (*** 12) | WLAN802.11 a/n/ac(20M) 5.6G | 5500 | _ | 5720 | | | |
| | WLAN802.11 n/ac(40M) 5.6G | 5510 | _ | 5710 | | | |
| | WLAN802.11 ac(80M) 5.6G | 5530 | _ | 5690 | | | |
| | WLAN802.11 a/n(20M)/ac(20M) 5.8G | 5745 | _ | 5825 | | | |
| | WLAN802.11 n(40M)/ac(40M) 5.8G | 5710 | _ | 5795 | | | |
| | WLAN802.11 ac(80M) 5.8G | | 5775 | | | | |
| | Bluetooth | 2402 | _ | 2480 | | | |

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| | _ | | | |
|---------------------------|----------------------------------|-----|-----|-----|
| | WLAN802.11 b/g/n(20M) | 1 | _ | 11 |
| | WLAN802.11 n(40M) | 3 | _ | 9 |
| | WLAN802.11 a/n(20M)/ac(20M) 5.2G | 36 | _ | 48 |
| | WLAN802.11 n(40M)/ac(40M) 5.2G | 38 | _ | 46 |
| | WLAN802.11 ac(80M) 5.2G | | 42 | |
| | WLAN802.11 a/n(20M)/ac(20M) 5.3G | 52 | _ | 64 |
| | WLAN802.11 n(40M)/ac(40M) 5.3G | 54 | _ | 62 |
| Channel Number (ARFCN) | WLAN802.11 ac(80M) 5.3G | | 58 | |
| | WLAN802.11 a/n/ac(20M) 5.6G | | _ | 144 |
| | WLAN802.11 n/ac(40M) 5.6G | | _ | 142 |
| | WLAN802.11 ac(80M) 5.6G | | _ | 138 |
| | WLAN802.11 a/n(20M)/ac(20M) 5.8G | 149 | _ | 165 |
| | WLAN802.11 n(40M)/ac(40M) 5.8G | 142 | _ | 159 |
| | WLAN802.11 ac(80M) 5.8G | | 155 | _ |
| | Bluetooth | 0 | _ | 78 |

Antenna peak gain table:

| • | HSN-I13C-4(Computron 14) | | | | | | | |
|-------------|--------------------------|------------|----------|---------|---------------------------------|------------|----------|---------|
| Vendor | | WI | NC | | WNC | | | |
| Antenna | | Main | (PIFA) | | | Aux (| PIFA) | |
| Part Number | 6036E | 30198201 (| 81EAA415 | 5.GAL) | 6036B | 0198401 (| 81EAA415 | .GAM) |
| Frequency | 2.4G | 5.2G | 5.5G | 5.8G | 2.4G | 5.2G | 5.5G | 5.8G |
| Gain (dBi) | -1.18 | -2.31 | -0.37 | -0.37 | -2.39 | -3.02 | -2.37 | -2.23 |
| Vendor | ACON ACON | | | ON | | | | |
| Antenna | | Main | (PIFA) | | Aux (PIFA) | | | |
| Part Number | 6036B0 | 18501 (P/I | N:ANP6Y- | 100180) | 6036B0198601 (P/N:ANP6Y-100181) | | | 100181) |
| Frequency | 2.4G | 5.2G | 5.5G | 5.8G | 2.4G | 5.2G | 5.5G | 5.8G |
| Gain (dBi) | -2.52 | -1.61 | -0.91 | 0.43 | -2.05 | -1.68 | -0.98 | -0.6 |
| Vendor | | Hon | g-Bo | | | Hon | g-Bo | |
| Antenna | Main (PIFA) Aux | | | Aux (| PIFA) | | | |
| Part Number | 6036B0219201(260-27178) | | | 603 | 36B021910 | 1(260-271) | 79) | |
| Frequency | 2.4G | 5.2G | 5.5G | 5.8G | 2.4G 5.2G 5.5G 5.8G | | | 5.8G |
| Gain (dBi) | -0.17 | -0.09 | -0.67 | -0.10 | -2.15 | 2.75 | 0.85 | -5.26 |

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The highest SAR values of WNC Antenna

| The mgn | The highest SAR values of WING Affletina | | | | | | |
|-----------------------------|--|----------|----------|---------|-------------|--|--|
| Max. SAR (1 g) (Unit: W/Kg) | | | | | | | |
| Antenna | Band | Measured | Reported | Channel | Position | | |
| | WLAN802.11 b | 0.24 | 0.25 | 11 | Bottom side | | |
| | WLAN802.11 g | 0.32 | 0.33 | 6 | Bottom side | | |
| Main | WLAN802.11 a 5.2G | 0.35 | 0.36 | 40 | Bottom side | | |
| Main | WLAN802.11 a 5.3G | 0.37 | 0.37 | 52 | Bottom side | | |
| | WLAN802.11 a 5.6G | 0.50 | 0.50 | 116 | Bottom side | | |
| | WLAN802.11 a 5.8G | 0.64 | 0.64 | 157 | Bottom side | | |
| | WLAN802.11 b | 0.35 | 0.35 | 1 | Bottom side | | |
| | WLAN802.11 g | 0.42 | 0.43 | 6 | Bottom side | | |
| Λ.ι.ν. | WLAN802.11 a 5.2G | 0.60 | 0.61 | 40 | Bottom side | | |
| Aux | WLAN802.11 a 5.3G | 0.49 | 0.49 | 52 | Bottom side | | |
| | WLAN802.11 a 5.6G | 0.71 | 0.71 | 104 | Bottom side | | |
| | WLAN802.11 a 5.8G | 0.53 | 0.54 | 149 | Bottom side | | |

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The highest SAR values of ACON Antenna

| | Max. SAR (1 g) (Unit: W/Kg) | | | | | | |
|---------|-----------------------------|----------|----------|---------|-------------|--|--|
| Antenna | Band | Measured | Reported | Channel | Position | | |
| | WLAN802.11 b | 0.24 | 0.24 | 11 | Bottom side | | |
| | WLAN802.11 g | 0.28 | 0.29 | 6 | Bottom side | | |
| Main | WLAN802.11 a 5.2G | 0.45 | 0.46 | 40 | Bottom side | | |
| IVIAIII | WLAN802.11 a 5.3G | 0.47 | 0.47 | 52 | Bottom side | | |
| | WLAN802.11 a 5.6G | 0.56 | 0.57 | 116 | Bottom side | | |
| | WLAN802.11 a 5.8G | 0.57 | 0.57 | 157 | Bottom side | | |
| | WLAN802.11 b | 0.10 | 0.11 | 1 | Bottom side | | |
| | WLAN802.11 g | 0.41 | 0.43 | 6 | Bottom side | | |
| Aux | WLAN802.11 a 5.2G | 0.42 | 0.42 | 40 | Bottom side | | |
| Aux | WLAN802.11 a 5.3G | 0.44 | 0.44 | 52 | Bottom side | | |
| | WLAN802.11 a 5.6G | 0.45 | 0.45 | 104 | Bottom side | | |
| | WLAN802.11 a 5.8G | 0.47 | 0.47 | 149 | Bottom side | | |

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The highest SAR values of Hong-Bo Antenna

| Max. SAR (1 g) (Unit: W/Kg) | | | | | | | |
|-----------------------------|-------------------|----------|----------|---------|-------------|--|--|
| Antenna | Band | Measured | Reported | Channel | Position | | |
| | WLAN802.11 b | 0.37 | 0.37 | 6 | Bottom side | | |
| | WLAN802.11 g | 0.46 | 0.46 | 6 | Bottom side | | |
| Main | WLAN802.11 a 5.2G | 0.36 | 0.36 | 40 | Bottom side | | |
| IVIAIII | WLAN802.11 a 5.3G | 0.32 | 0.32 | 52 | Bottom side | | |
| | WLAN802.11 a 5.6G | 0.50 | 0.50 | 116 | Bottom side | | |
| | WLAN802.11 a 5.8G | 0.88 | 0.88 | 157 | Bottom side | | |
| | WLAN802.11 b | 0.37 | 0.37 | 1 | Bottom side | | |
| | WLAN802.11 g | 0.46 | 0.46 | 6 | Bottom side | | |
| Ausz | WLAN802.11 a 5.2G | 0.65 | 0.65 | 40 | Bottom side | | |
| Aux | WLAN802.11 a 5.3G | 0.40 | 0.40 | 52 | Bottom side | | |
| | WLAN802.11 a 5.6G | 0.64 | 0.64 | 104 | Bottom side | | |
| | WLAN802.11 a 5.8G | 0.35 | 0.35 | 165 | Bottom side | | |

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WLAN802.11 a/b/g/n(20M/40M)/ac(20M/40M/80M) conducted power table:

| 112/ 11002111 dr. 5/9/11(2011/ 1011)/do(2011/ 1011/0011/) 0011dddtod porton tabi | | | | | |
|--|---------|---------|----------|--|--|
| Antenna | SI | SO | MIMO | | |
| Band | Chain 0 | Chain 1 | Chain0+1 | | |
| WLAN802.11b | V | V | _ | | |
| WLAN802.11g | V | V | _ | | |
| WLAN802.11n(20M) | V | V | V | | |
| WLAN802.11n(40M) | V | V | V | | |
| WLAN802.11ac | V | V | V | | |
| WLAN802.11a | V | V | _ | | |
| WLAN802.11n(20M) 5G | V | V | V | | |
| WLAN802.11n(40M) 5G | V | V | V | | |
| WLAN802.11ac(20M) 5G | V | V | V | | |
| WLAN802.11ac(40M) 5G | V | V | V | | |
| WLAN802.11ac(80M) 5G | V | V | V | | |

For WNC/ACON Antenna WLAN Power table:

| Main Antenna | | | | | | | | | |
|--------------|--------------|---------|--------------------|-----------|--|---------------------------|--|--|--|
| Band | Mode | Channel | Frequency (MHz) | Data Rate | Max. Rated Avg. Power + Max. Tolerance (dBm) | Average power (dBm) | | | |
| | | 1 | 2412 | | 17.00 | 16.85 | | | |
| | 802.11b | 6 | 2437 | 1Mbps | 17.00 | 16.78 | | | |
| | | 11 | 2462 | | 17.00 | 16.93 | | | |
| | | 1 | 2412 | | 14.00 | 13.82 | | | |
| | 802.11g | 6 | 2437 | 6Mbps | 18.00 | 17.90 | | | |
| 2450 MHz | | 11 | 2462 | | 15.00 | 14.96 | | | |
| 2430 WII IZ | | 1 | 2412 | | 14.00 | 13.76 | | | |
| | 802.11n-HT20 | 6 | 2437 | MCS0 | 18.00 | 17.88 | | | |
| | | 11 | 2462 | | 14.00 | 13.81 | | | |
| | | 3 | 2422 | | 14.00 | 13.82 | | | |
| | 802.11n-HT40 | 6 | 2437 | MCS0 | 17.00 | 16.77 | | | |
| | | 9 | 2452 | | 14.00 | 13.90 | | | |

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| Main Antenna | | | | | | | | | |
|---------------|-----------------------|---------|--------------------|-----------|--|---------------------------|--|--|--|
| Band | Mode | Channel | Frequency (MHz) | Data Rate | Max. Rated Avg. Power + Max. Tolerance (dBm) | Average power (dBm) | | | |
| | | 36 | 5180 | | 16.50 | 16.41 | | | |
| | 802.11a | 40 | 5200 | 6Mbps | 17.50 | 17.43 | | | |
| | 002.11a | 44 | 5220 | Olvibbs | 17.50 | 17.31 | | | |
| | | 48 | 5240 | | 17.50 | 17.32 | | | |
| | | 36 | 5180 | | 16.50 | 16.33 | | | |
| | 802.11n-HT20 | 40 | 5200 | MCS0 | 17.50 | 17.37 | | | |
| | 002.1111-11120 | 44 | 5220 | | 17.50 | 17.40 | | | |
| | | 48 | 5240 | | 17.50 | 17.35 | | | |
| 5.15-5.25 GHz | | 36 | 5180 | | 16.50 | 16.42 | | | |
| | 802.11n-VHT20 | 40 | 5200 | MCS0 | 17.50 | 17.39 | | | |
| | 002.1111-111120 | 44 | 5220 | I WICOU | 17.50 | 17.43 | | | |
| | | 48 | 5240 | | 17.50 | 17.40 | | | |
| | 802.11n-HT40 | 38 | 5190 | MCS0 | 12.50 | 12.43 | | | |
| | 002.1111-11140 | 46 | 5230 | IVICOU | 16.50 | 16.37 | | | |
| | 802.11n-VHT40 | 38 | 5190 | MCS0 | 12.50 | 12.46 | | | |
| | 1002. I III-V II I 40 | 46 | 5230 | IVICOU | 16.50 | 16.39 | | | |
| | 802.11n-VHT80 | 42 | 5210 | MCS0 | 11.50 | 11.44 | | | |

| Main Antenna | | | | | | | | | |
|---------------|---------------------|---------|--------------------|-----------|--|---------------------------|--|--|--|
| Band | Mode | Channel | Frequency (MHz) | Data Rate | Max. Rated Avg. Power + Max. Tolerance (dBm) | Average power (dBm) | | | |
| | | 52 | 5260 | | 17.50 | 17.47 | | | |
| | 802.11a | 56 | 5280 | 6Mbps | 17.50 | 17.42 | | | |
| | 002.11a | 60 | 5300 | Olvibbs | 17.50 | 17.35 | | | |
| | | 64 | 5320 | | 15.50 | 15.46 | | | |
| | 802.11n-HT20 | 52 | 5260 | | 17.50 | 17.47 | | | |
| | | 56 | 5280 | MCS0 | 17.50 | 17.36 | | | |
| | | 60 | 5300 | IVICSU | 17.50 | 17.35 | | | |
| | | 64 | 5320 | | 15.50 | 17.41 | | | |
| 5.25-5.35 GHz | | 52 | 5260 | | 17.50 | 17.46 | | | |
| | 802.11n-VHT20 | 56 | 5280 | MCS0 | 17.50 | 17.42 | | | |
| | 002.1111-111120 | 60 | 5300 | IVICSO | 17.50 | 17.39 | | | |
| | | 64 | 5320 | | 15.50 | 15.41 | | | |
| | 802.11n-HT40 | 54 | 5270 | MCS0 | 16.50 | 16.39 | | | |
| | 002.1111-11140 | 62 | 5310 | IVICOU | 13.50 | 13.35 | | | |
| | 802.11n-VHT40 | 54 | 5270 | MCS0 | 16.50 | 16.38 | | | |
| | 1002. I III-VH I 40 | 62 | 5310 | IVICSU | 13.50 | 13.42 | | | |
| | 802.11n-VHT80 | 58 | 5290 | MCS0 | 11.50 | 11.44 | | | |

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| | | | Main Antenr | na | | |
|----------|---------------|------------|--------------------|------------|--|---------------------------|
| Band | Mode | Channel | Frequency (MHz) | Data Rate | Max. Rated Avg. Power + Max. Tolerance (dBm) | Average power (dBm) |
| | | 100 | 5500 | | 14.50 | 14.36 |
| | | 104 | 5520 | 1 [| 17.50 | 17.37 |
| | | 116 | 5580 |] [| 17.50 | 17.43 |
| | 802.11a | 120 | 5600 | 6Mbps | 17.50 | 17.33 |
| | 002.114 | 124 | 5620 | Olvibps | 17.50 | 17.37 |
| | | 128 | 5640 |] [| 17.50 | 17.43 |
| | | 136 | 5680 | | 17.50 | 17.33 |
| | | 140 | 5700 | | 15.50 | 15.41 |
| | | 100 | 5500 | | 14.50 | 14.37 |
| | | 104 | 5520 | - | 17.50 | 17.35 |
| | | 116 | 5580 | ↓ ↓ | 17.50 | 17.44 |
| | 802.11n-HT20 | 120 | 5600 | MCS0 | 17.50 | 17.31 |
| | | 124 | 5620 | . | 17.50 | 17.33 |
| | | 128 | 5640 | | 17.50 | 17.35 |
| | | 136 | 5680 | | 17.50 | 17.43 |
| | | 140 | 5700 | | 14.50 | 14.38 |
| | | 100 104 | 5500 5520 | - I | 14.50 17.50 | 14.40 17.38 |
| | | 116 | 5580 | 1 - | 17.50 | 17.30 |
| | | 120 | 5600 | MCS0 | 17.50 | 17.39 |
| 5600 MHz | 802.11n-VHT20 | | 5620 | | 17.50 | 17.37 |
| | 002.11.11 | 128 | 5640 | 1 | 17.50 | 17.35 |
| | | 136 | 5680 | 1 † | 17.50 | 17.46 |
| | | 140 | 5700 | 1 1 | 14.50 | 14.32 |
| | | 144 | 5720 | 1 1 | 14.50 | 14.38 |
| | | 102 | 5510 | | 13.50 | 13.45 |
| | | 110 | 5550 | 1 [| 16.50 | 16.36 |
| | 802.11n-HT40 | 118 | 5590 | MCS0 | 16.50 | 16.31 |
| | 002.1111-1140 | 126 | 5630 | | 16.50 | 16.30 |
| | | 134 | 5670 |] [| 16.50 | 16.41 |
| | | 142 | 5710 | | 16.50 | 16.32 |
| | | 102 | 5510 |] [| 13.50 | 13.47 |
| | | 110 | 5550 |] [| 16.50 | 16.45 |
| | 802.11n-VHT40 | 118 | 5590 | MCS0 | 16.50 | 16.32 |
| | | 120 | 5630 | 555 | 16.50 | 16.30 |
| | | 134 | 5670 | . L | 16.50 | 16.38 |
| | | 142 | 5710 | | 16.50 | 16.36 |
| | | 106 | 5530 |] [| 11.50 | 11.43 |
| | 802.11n-VHT80 | | 5610 | MCS0 | 16.50 | 16.11 |
| | | 138 | 5690 | | 16.50 | 16.38 |

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| | Main Antenna | | | | | | | | | |
|-------------|----------------|---------|--------------------|-----------|--|---------------------------|--|--|--|--|
| Mode | Mode | Channel | Frequency (MHz) | Data Rate | Max. Rated Avg. Power + Max. Tolerance (dBm) | Average power (dBm) | | | | |
| | | 149 | 5745 | | 17.50 | 17.34 | | | | |
| | 802.11a | 157 | 5785 | 6Mbps | 17.50 | 17.48 | | | | |
| | | 165 | 5825 | | 17.50 | 17.36 | | | | |
| | | 149 | 5745 | | 17.50 | 17.39 | | | | |
| | 802.11n-HT20 | 157 | 5785 | MCS0 | 17.50 | 17.43 | | | | |
| | | 165 | 5825 | | 17.50 | 17.30 | | | | |
| 5800 MHz | | 149 | 5745 | | 17.50 | 17.36 | | | | |
| 3000 WII 12 | 802.11n-VHT20 | 157 | 5785 | MCS0 | 17.50 | 17.45 | | | | |
| | | 165 | 5825 | | 17.50 | 17.40 | | | | |
| | 802.11n-HT40 | 151 | 5755 | MCS0 | 16.50 | 16.34 | | | | |
| | 002.1111-11140 | 159 | 5795 | IVICOU | 16.50 | 16.32 | | | | |
| | 802.11n-VHT40 | 151 | 5755 | MCS0 | 16.50 | 16.41 | | | | |
| | 002.1111-11140 | 159 | 5795 | IVICSU | 16.50 | 16.37 | | | | |
| | 802.11n-VHT80 | 155 | 5775 | MCS0 | 16.50 | 16.42 | | | | |

| Aux Antenna | | | | | | | | | |
|--------------|--------------|---------|--------------------|-----------|--|---------------------------|--|--|--|
| Band | Mode | Channel | Frequency (MHz) | Data Rate | Max. Rated Avg. Power + Max. Tolerance (dBm) | Average power (dBm) | | | |
| | | 1 | 2412 | | 17.00 | 16.97 | | | |
| | 802.11b | 6 | 2437 | 1Mbps | 17.00 | 16.95 | | | |
| | | 11 | 2462 | | 17.00 | 16.92 | | | |
| | | 1 | 2412 | | 14.00 | 13.92 | | | |
| | 802.11g | 6 | 2437 | 6Mbps | 18.00 | 17.85 | | | |
| 2450 MHz | | 11 | 2462 |] [| 15.00 | 14.89 | | | |
| 2430 1011 12 | | 1 | 2412 | | 14.00 | 13.83 | | | |
| | 802.11n-HT20 | 6 | 2437 | MCS0 | 18.00 | 17.92 | | | |
| | | 11 | 2462 |] [| 14.00 | 13.94 | | | |
| | | 3 | 2422 | | 14.00 | 13.86 | | | |
| | 802.11n-HT40 | 6 | 2437 | MCS0 | 17.00 | 16.94 | | | |
| | | 9 | 2452 | | 14.00 | 13.80 | | | |

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| | | | Aux Antenna | a | | |
|---------------|-----------------|---------|--------------------|-----------|--|---------------------------|
| Band | Mode | Channel | Frequency (MHz) | Data Rate | Max. Rated Avg. Power + Max. Tolerance (dBm) | Average power (dBm) |
| | | 36 | 5180 | | 16.50 | 16.38 |
| | 802.11a | 40 | 5200 | 6Mbps | 17.50 | 17.43 |
| | 002.11a | 44 | 5220 | Olvibps | 17.50 | 17.39 |
| | | 48 | 5240 | | 17.50 | 17.32 |
| | 802.11n-HT20 | 36 | 5180 | | 16.50 | 16.40 |
| | | 40 | 5200 | MCS0 | 17.50 | 17.31 |
| | | 44 | 5220 | IVICOU | 17.50 | 17.38 |
| | | 48 | 5240 | | 17.50 | 17.42 |
| 5.15-5.25 GHz | | 36 | 5180 | | 16.50 | 16.47 |
| | 802.11n-VHT20 | 40 | 5200 | MCS0 | 17.50 | 17.43 |
| | 002.1111-111120 | 44 | 5220 | I WICSO | 17.50 | 17.35 |
| | | 48 | 5240 | | 17.50 | 17.29 |
| | 802.11n-HT40 | 38 | 5190 | MCS0 | 12.50 | 12.27 |
| ļ | 002.1111-11140 | 46 | 5230 | IVICOU | 16.50 | 16.45 |
| | 802.11n-VHT40 | 38 | 5190 | MCS0 | 12.50 | 12.33 |
| | 002.1111-711140 | 46 | 5230 | IVICOU | 16.50 | 16.37 |
| | 802.11n-VHT80 | 42 | 5210 | MCS0 | 11.50 | 11.42 |

| | Aux Antenna | | | | | | | | | |
|---------------|-----------------|---------|--------------------|-----------|--|---------------------------|--|--|--|--|
| Band | Mode | Channel | Frequency (MHz) | Data Rate | Max. Rated Avg. Power + Max. Tolerance (dBm) | Average power (dBm) | | | | |
| | | 52 | 5260 | | 17.50 | 17.49 | | | | |
| | 802.11a | 56 | 5280 | 6Mbps | 17.50 | 17.46 | | | | |
| | 002.11a | 60 | 5300 | Olvibps | 17.50 | 17.42 | | | | |
| | | 64 | 5320 | | 15.50 | 15.40 | | | | |
| | | 52 | 5260 | | 17.50 | 17.44 | | | | |
| | 802.11n-HT20 | 56 | 5280 | MCS0 | 17.50 | 17.35 | | | | |
| | 002.1111-11120 | 60 | 5300 | WCGO | 17.50 | 17.46 | | | | |
| | | 64 | 5320 | | 15.50 | 15.38 | | | | |
| 5.25-5.35 GHz | | 52 | 5260 | | 17.50 | 17.42 | | | | |
| | 802.11n-VHT20 | 56 | 5280 | MCS0 | 17.50 | 17.40 | | | | |
| | 002.1111-111120 | 60 | 5300 | I WICSO | 17.50 | 17.36 | | | | |
| | | 64 | 5320 | | 15.50 | 15.47 | | | | |
| | 802.11n-HT40 | 54 | 5270 | MCS0 | 16.50 | 16.45 | | | | |
| | 002.1111-11140 | 62 | 5310 | IVICSU | 13.50 | 13.29 | | | | |
| | 802.11n-VHT40 | 54 | 5270 | MCS0 | 16.50 | 16.41 | | | | |
| | 002.1111-711140 | 62 | 5310 | IVICOU | 13.50 | 13.37 | | | | |
| | 802.11n-VHT80 | 58 | 5290 | MCS0 | 11.50 | 11.43 | | | | |

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| | | | Aux Antenn | a | | |
|----------|-------------------|------------|--------------------|-----------|--|---------------------------|
| | | | | ~ | | |
| Band | Mode | Channel | Frequency (MHz) | Data Rate | Max. Rated Avg. Power + Max. Tolerance (dBm) | Average power (dBm) |
| | | 100 | 5500 | | 14.50 | 14.43 |
| | | 104 | 5520 | i i | 17.50 | 17.46 |
| | | 116 | 5580 | i | 17.50 | 17.34 |
| | 802.11a | 120 | 5600 | 6Mbps | 17.50 | 17.42 |
| | 002.11a | 124 | 5620 | Olvibpa | 17.50 | 17.46 |
| | | 128 | 5640 | | 17.50 | 17.34 |
| | | 136 | 5680 | | 17.50 | 17.42 |
| | | 140 | 5700 | | 15.50 | 15.42 |
| | | 100 | 5500 | | 14.50 | 14.45 |
| | | 104 | 5520 | | 17.50 | 17.48 |
| | | 116 | 5580 | | 17.50 | 17.43 |
| | 802.11n-HT20 | 120 | 5600 | MCS0 | 17.50 | 17.32 |
| | | 124 | 5620 | | 17.50 | 17.34 |
| | | 128 | 5640 | | 17.50 | 17.36 |
| | | 136 | 5680 5700 | | 17.50 | 17.45 |
| | | 140 100 | 5500 | | 14.50 14.50 | 14.39 14.47 |
| | | 104 | 5520 | | 17.50 | 17.36 |
| | | 116 | 5580 | MCS0 | 17.50 | 17.45 |
| | | 120 | 5600 | | 17.50 | 17.38 |
| 5600 MHz | 802.11n-VHT20 | | 5620 | | 17.50 | 17.36 |
| | | 128 | 5640 | | 17.50 | 17.34 |
| | | 136 | 5680 | | 17.50 | 17.40 |
| | | 140 | 5700 | i i | 14.50 | 14.37 |
| | | 144 | 5720 | | 14.50 | 14.40 |
| | | 102 | 5510 | | 13.50 | 13.42 |
| | | 110 | 5550 | | 16.50 | 16.46 |
| | 802.11n-HT40 | 118 | 5590 | MCS0 | 16.50 | 16.36 |
| | 002.1111-111-40 | 126 | 5630 | IVIOCO | 16.50 | 16.35 |
| | | 134 | 5670 | | 16.50 | 16.41 |
| | | 142 | 5710 | | 16.50 | 16.31 |
| | | 102 | 5510 | | 13.50 | 13.37 |
| | | 110 | 5550 | | 16.50 | 16.35 |
| | 802.11n-VHT40 | 118 | 5590 | MCS0 | 16.50 | 16.31 |
| | | 126 | 5630 | | 16.50 | 16.30 |
| | | 134 | 5670 | | 16.50 | 16.40 |
| | | 142 | 5710 | | 16.50 | 16.47 |
| | 000 44 \ (1.1700) | 106 | 5530 | MCCC | 11.50 | 11.33 |
| | 802.11n-VHT80 | | 5610 | MCS0 | 16.50 | 16.30 |
| | | 138 | 5690 | | 16.50 | 16.42 |

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| | Aux Antenna | | | | | | | | |
|--------------|----------------|---------|--------------------|-----------|--|---------------------------|--|--|--|
| Mode | Mode | Channel | Frequency (MHz) | Data Rate | Max. Rated Avg. Power + Max. Tolerance (dBm) | Average power (dBm) | | | |
| | | 149 | 5745 | | 17.50 | 17.47 | | | |
| | 802.11a | 157 | 5785 | 6Mbps | 17.50 | 17.41 | | | |
| | | 165 | 5825 | | 17.50 | 17.39 | | | |
| | 802.11n-HT20 | 149 | 5745 | MCS0 | 17.50 | 17.30 | | | |
| | | 157 | 5785 | | 17.50 | 17.41 | | | |
| | | 165 | 5825 | | 17.50 | 17.45 | | | |
| 5800 MHz | | 149 | 5745 | | 17.50 | 17.44 | | | |
| 3000 1011 12 | 802.11n-VHT20 | 157 | 5785 | MCS0 | 17.50 | 17.35 | | | |
| | | 165 | 5825 | | 17.50 | 17.39 | | | |
| | 802.11n-HT40 | 151 | 5755 | MCS0 | 16.50 | 16.43 | | | |
| | 002.1111-11140 | 159 | 5795 | IVICOU | 16.50 | 16.46 | | | |
| | 802.11n-VHT40 | 151 | 5755 | MCS0 | 16.50 | 16.38 | | | |
| | | 159 | 5795 | | 16.50 | 16.33 | | | |
| | 802.11n-VHT80 | 155 | 5775 | MCS0 | 16.50 | 16.40 | | | |

For Hong-Bo Antenna WI AN Power table:

| TO HONG-BO Antenna WEANT OWER Lable. | | | | | | | | | |
|--------------------------------------|--------------|---------|--------------------|-----------|--|---------------------------|--|--|--|
| Main Antenna | | | | | | | | | |
| Band | Mode | Channel | Frequency (MHz) | Data Rate | Max. Rated Avg. Power + Max. Tolerance (dBm) | Average power (dBm) | | | |
| | | 1 | 2412 | | 17.00 | 16.84 | | | |
| | 802.11b | 6 | 2437 | 1Mbps | 17.00 | 16.98 | | | |
| | | 11 | 2462 | | 17.00 | 16.92 | | | |
| | | 1 | 2412 | | 14.00 | 13.98 | | | |
| | 802.11g | 6 | 2437 | 6Mbps | 18.00 | 18.00 | | | |
| 2450 MHz | | 11 | 2462 | | 15.00 | 14.88 | | | |
| 2430 10172 | | 1 | 2412 | | 14.00 | 13.76 | | | |
| | 802.11n-HT20 | 6 | 2437 | MCS0 | 18.00 | 17.88 | | | |
| | | 11 | 2462 | | 14.00 | 13.81 | | | |
| | 802.11n-HT40 | 3 | 2422 | MCS0 | 14.00 | 13.82 | | | |
| | | 6 | 2437 | | 17.00 | 16.77 | | | |
| | | 9 | 2452 | | 14.00 | 13.90 | | | |

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| | | | Main Antenr | na | | |
|---------------|-----------------|---------|--------------------|-----------|--|---------------------------|
| Band | Mode | Channel | Frequency (MHz) | Data Rate | Max. Rated Avg. Power + Max. Tolerance (dBm) | Average power (dBm) |
| | | 36 | 5180 | | 16.50 | 16.50 |
| | 802.11a | 40 | 5200 | 6Mbps | 17.50 | 17.50 |
| | 002.11a | 44 | 5220 | Olvibps | 17.50 | 17.47 |
| | | 48 | 5240 | | 17.50 | 17.42 |
| | 802.11n-HT20 | 36 | 5180 | | 16.50 | 16.33 |
| | | 40 | 5200 | MCS0 | 17.50 | 17.37 |
| | | 44 | 5220 | | 17.50 | 17.40 |
| | | 48 | 5240 | 1 [| 17.50 | 17.35 |
| 5.15-5.25 GHz | | 36 | 5180 | | 16.50 | 16.42 |
| | 802.11n-VHT20 | 40 | 5200 | MCS0 | 17.50 | 17.39 |
| | 002.1111-111120 | 44 | 5220 | I WICSO | 17.50 | 17.43 |
| | | 48 | 5240 | | 17.50 | 17.40 |
| | 802.11n-HT40 | 38 | 5190 | MCS0 | 12.50 | 12.43 |
| | 002.1111-11140 | 46 | 5230 | IVICOU | 16.50 | 16.37 |
| | 802.11n-VHT40 | 38 | 5190 | MCS0 | 12.50 | 12.46 |
| | | 46 | 5230 | IVICOU | 16.50 | 16.39 |
| | 802.11n-VHT80 | 42 | 5210 | MCS0 | 11.50 | 11.44 |

| | Main Antenna | | | | | | | | |
|---------------|-----------------|---------|--------------------|-----------|--|---------------------------|--|--|--|
| Band | Mode | Channel | Frequency (MHz) | Data Rate | Max. Rated Avg. Power + Max. Tolerance (dBm) | Average power (dBm) | | | |
| | | 52 | 5260 | | 17.50 | 17.50 | | | |
| | 802.11a | 56 | 5280 | 6Mbps | 17.50 | 17.49 | | | |
| | 002.11a | 60 | 5300 | Givibps | 17.50 | 17.45 | | | |
| | | 64 | 5320 | 1 | 15.50 | 15.46 | | | |
| | 802.11n-HT20 | 52 | 5260 | | 17.50 | 17.47 | | | |
| | | 56 | 5280 | MCS0 | 17.50 | 17.36 | | | |
| | | 60 | 5300 | | 17.50 | 17.35 | | | |
| | | 64 | 5320 | | 15.50 | 17.41 | | | |
| 5.25-5.35 GHz | | 52 | 5260 | | 17.50 | 17.46 | | | |
| | 802.11n-VHT20 | 56 | 5280 | MCS0 | 17.50 | 17.42 | | | |
| | 002.1111-711120 | 60 | 5300 | MCSU | 17.50 | 17.39 | | | |
| | | 64 | 5320 | 1 [| 15.50 | 15.41 | | | |
| | 802.11n-HT40 | 54 | 5270 | MCS0 | 16.50 | 16.39 | | | |
| | 002.1111-11140 | 62 | 5310 | IVICOU | 13.50 | 13.35 | | | |
| | 902 11p-\/UT40 | 54 | 5270 | MCS0 | 16.50 | 16.38 | | | |
| | 802.11n-VHT40 | 62 | 5310 | IVICOU | 13.50 | 13.42 | | | |
| | 802.11n-VHT80 | 58 | 5290 | MCS0 | 11.50 | 11.44 | | | |

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| | | | Main Antenr | <u> </u> | | |
|----------|------------------|------------|--------------------|-----------|--|---------------------------|
| | | | THAIL THEOLIT | | | |
| Band | Mode | Channel | Frequency (MHz) | Data Rate | Max. Rated Avg. Power + Max. Tolerance (dBm) | Average power (dBm) |
| | | 100 | 5500 | | 14.50 | 14.36 |
| | | 104 | 5520 | 1 1 | 17.50 | 17.47 |
| | | 116 | 5580 |] [| 17.50 | 17.50 |
| | 802.11a | 120 | 5600 | 6Mbps | 17.50 | 17.33 |
| | 002.11a | 124 | 5620 | Olvibpa | 17.50 | 17.37 |
| | | 128 | 5640 | | 17.50 | 17.43 |
| | | 136 | 5680 | | 17.50 | 17.49 |
| | | 140 | 5700 | | 15.50 | 15.41 |
| | | 100 | 5500 | | 14.50 | 14.37 |
| | | 104 | 5520 | | 17.50 | 17.35 |
| | | 116 | 5580 | | 17.50 | 17.44 |
| | 802.11n-HT20 | 120 | 5600 | MCS0 | 17.50 | 17.31 |
| | | 124 | 5620 | ļ | 17.50 | 17.33 |
| | | 128 | 5640 | | 17.50 17.50 | 17.35 |
| | | 136 140 | 5680 5700 | { | 14.50 | 17.43 14.38 |
| | | 100 | 5500 | MCS0 | 14.50 | 14.40 |
| | | 104 | 5520 | | 17.50 | 17.38 |
| | | 116 | 5580 | | 17.50 | 17.40 |
| | | 120 | 5600 | | 17.50 | 17.39 |
| 5600 MHz | 802.11n-VHT20 | | 5620 | | 17.50 | 17.37 |
| | | 128 | 5640 | 1 1 | 17.50 | 17.35 |
| | | 136 | 5680 | 1 1 | 17.50 | 17.46 |
| | | 140 | 5700 |] [| 14.50 | 14.32 |
| | | 144 | 5720 | | 14.50 | 14.38 |
| | | 102 | 5510 | | 13.50 | 13.45 |
| | | 110 | 5550 |] [| 16.50 | 16.36 |
| | 802.11n-HT40 | 118 | 5590 | MCS0 | 16.50 | 16.31 |
| | 002.11.11.10 | 126 | 5630 | | 16.50 | 16.30 |
| | | 134 | 5670 | | 16.50 | 16.41 |
| | | 142 | 5710 | | 16.50 | 16.32 |
| | | 102 | 5510 | | 13.50 | 13.47 |
| | | 110 | 5550 | | 16.50 | 16.45 |
| | 802.11n-VHT40 | 118 | 5590 | MCS0 | 16.50 | 16.32 |
| | | 126 | 5630 | | 16.50 | 16.30 |
| | | 134 | 5670 | | 16.50 | 16.38 |
| | | 142 | 5710 5520 | | 16.50 | 16.36 |
| | 802.11n-VHT80 | 106 | 5530 | MCS0 | 11.50 | 11.43 |
| | 1002.1111-111100 | | 5610 | IVICOU | 16.50 | 16.11 |
| | | 138 | 5690 | | 16.50 | 16.38 |

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| | Main Antenna | | | | | | | | |
|--------------|----------------|---------|--------------------|-----------|--|---------------------------|--|--|--|
| Mode | Mode | Channel | Frequency (MHz) | Data Rate | Max. Rated Avg. Power + Max. Tolerance (dBm) | Average power (dBm) | | | |
| | | 149 | 5745 | | 17.50 | 17.48 | | | |
| | 802.11a | 157 | 5785 | 6Mbps | 17.50 | 17.50 | | | |
| | | 165 | 5825 | | 17.50 | 17.42 | | | |
| | 802.11n-HT20 | 149 | 5745 | MCS0 | 17.50 | 17.39 | | | |
| | | 157 | 5785 | | 17.50 | 17.43 | | | |
| | | 165 | 5825 | | 17.50 | 17.30 | | | |
| 5800 MHz | | 149 | 5745 | | 17.50 | 17.36 | | | |
| 3000 1011 12 | 802.11n-VHT20 | 157 | 5785 | MCS0 | 17.50 | 17.45 | | | |
| | | 165 | 5825 | | 17.50 | 17.40 | | | |
| | 802.11n-HT40 | 151 | 5755 | MCS0 | 16.50 | 16.34 | | | |
| | 002.1111-11140 | 159 | 5795 | IVICOU | 16.50 | 16.32 | | | |
| | 802.11n-VHT40 | 151 | 5755 | MCS0 | 16.50 | 16.41 | | | |
| | 802.11n-VH140 | 159 | 5795 | IVICSU | 16.50 | 16.37 | | | |
| | 802.11n-VHT80 | 155 | 5775 | MCS0 | 16.50 | 16.42 | | | |

| Aux Antenna | | | | | | | | |
|-------------|--------------|---------|--------------------|-----------|--|---------------------------|--|--|
| Band | Mode | Channel | Frequency (MHz) | Data Rate | Max. Rated Avg. Power + Max. Tolerance (dBm) | Average power (dBm) | | |
| | | 1 | 2412 | | 17.00 | 17.00 | | |
| | 802.11b | 6 | 2437 | 1Mbps | 17.00 | 16.98 | | |
| | | 11 | 2462 | | 17.00 | 16.94 | | |
| | 802.11g | 1 | 2412 | | 14.00 | 14.00 | | |
| | | 6 | 2437 | 6Mbps | 18.00 | 17.96 | | |
| 2450 MHz | | 11 | 2462 | | 15.00 | 14.98 | | |
| 2430 10172 | | 1 | 2412 | | 14.00 | 13.83 | | |
| | 802.11n-HT20 | 6 | 2437 | MCS0 | 18.00 | 17.92 | | |
| | | 11 | 2462 | | 14.00 | 13.94 | | |
| | | 3 | 2422 | | 14.00 | 13.86 | | |
| | 802.11n-HT40 | 6 | 2437 | MCS0 | 17.00 | 16.94 | | |
| | | 9 | 2452 | | 14.00 | 13.80 | | |

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| | | | Aux Antenn | а | | |
|---------------|-----------------|---------|--------------------|-----------|--|---------------------------|
| Band | Mode | Channel | Frequency (MHz) | Data Rate | Max. Rated Avg. Power + Max. Tolerance (dBm) | Average power (dBm) |
| | | 36 | 5180 | | 16.50 | 16.50 |
| | 802.11a | 40 | 5200 | 6Mbps | 17.50 | 17.50 |
| | 002.11a | 44 | 5220 | Givibps | 17.50 | 17.49 |
| | | 48 | 5240 | | 17.50 | 17.44 |
| | 802.11n-HT20 | 36 | 5180 | | 16.50 | 16.40 |
| | | 40 | 5200 | MCS0 | 17.50 | 17.31 |
| | | 44 | 5220 | | 17.50 | 17.38 |
| | | 48 | 5240 | 1 [| 17.50 | 17.42 |
| 5.15-5.25 GHz | | 36 | 5180 | | 16.50 | 16.47 |
| | 802.11n-VHT20 | 40 | 5200 | MCS0 | 17.50 | 17.43 |
| | 002.1111-111120 | 44 | 5220 | IVICSO | 17.50 | 17.35 |
| | | 48 | 5240 | | 17.50 | 17.29 |
| | 802.11n-HT40 | 38 | 5190 | MCS0 | 12.50 | 12.27 |
| | 002.1111-11140 | 46 | 5230 | IVICOU | 16.50 | 16.45 |
| | 802.11n-VHT40 | 38 | 5190 | MCS0 | 12.50 | 12.33 |
| | | 46 | 5230 | MICOU | 16.50 | 16.37 |
| | 802.11n-VHT80 | 42 | 5210 | MCS0 | 11.50 | 11.42 |

| | | | Aux Antenn | а | | |
|---------------|-----------------|---------|--------------------|-----------|--|---------------------------|
| Band | Mode | Channel | Frequency (MHz) | Data Rate | Max. Rated Avg. Power + Max. Tolerance (dBm) | Average power (dBm) |
| | | 52 | 5260 | | 17.50 | 17.50 |
| | 802.11a | 56 | 5280 | 6Mbps | 17.50 | 17.46 |
| | 002.11a | 60 | 5300 | Givibps | 17.50 | 17.39 |
| | | 64 | 5320 | | 15.50 | 15.38 |
| | 802.11n-HT20 | 52 | 5260 | | 17.50 | 17.44 |
| | | 56 | 5280 | MCS0 | 17.50 | 17.35 |
| | | 60 | 5300 | | 17.50 | 17.46 |
| | | 64 | 5320 | | 15.50 | 15.38 |
| 5.25-5.35 GHz | | 52 | 5260 | | 17.50 | 17.42 |
| | 802.11n-VHT20 | 56 | 5280 | MCS0 | 17.50 | 17.40 |
| | 002.1111-111120 | 60 | 5300 | I WICSO | 17.50 | 17.36 |
| | | 64 | 5320 |] [| 15.50 | 15.47 |
| | 802.11n-HT40 | 54 | 5270 | MCS0 | 16.50 | 16.45 |
| | 002.1111-11140 | 62 | 5310 | IVICOU | 13.50 | 13.29 |
| | 802.11n-VHT40 | 54 | 5270 | MCS0 | 16.50 | 16.41 |
| | | 62 | 5310 | IVICOU | 13.50 | 13.37 |
| | 802.11n-VHT80 | 58 | 5290 | MCS0 | 11.50 | 11.43 |

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| | | | Aux Antenn | a | | |
|-----------|-----------------|------------|--------------------|--------------|--|---------------------------|
| | | | , tax / tritoriii | | | |
| Band | Mode | Channel | Frequency (MHz) | Data Rate | Max. Rated Avg. Power + Max. Tolerance (dBm) | Average power (dBm) |
| | | 100 | 5500 | | 14.50 | 14.43 |
| | | 104 | 5520 |] [| 17.50 | 17.50 |
| | | 116 | 5580 | | 17.50 | 17.48 |
| | 802.11a | 120 | 5600 | 6Mbps | 17.50 | 17.42 |
| | 002.114 | 124 | 5620 | Olvibps | 17.50 | 17.46 |
| | | 128 | 5640 | | 17.50 | 17.34 |
| | | 136 | 5680 | | 17.50 | 17.39 |
| | | 140 | 5700 | | 15.50 | 15.42 |
| | | 100 | 5500 | | 14.50 | 14.45 |
| | | 104 | 5520 | ļ ļ | 17.50 | 17.48 |
| | | 116 | 5580 | ļ ļ | 17.50 | 17.43 |
| | 802.11n-HT20 | 120 | 5600 | MCS0 | 17.50 | 17.32 |
| | | 124 | 5620 | | 17.50 17.50 | 17.34 |
| | | 128 136 | 5640 5680 | | 17.50 | 17.36 17.45 |
| | | 140 | 5700 | | 14.50 | 14.39 |
| | | 100 | 5500 | | 14.50 | 14.47 |
| | | 104 | 5520 | 1 | 17.50 | 17.36 |
| | | 116 | 5580 | MCS0 | 17.50 | 17.45 |
| 5000 1411 | | 120 | 5600 | | 17.50 | 17.38 |
| 5600 MHz | 802.11n-VHT20 | | 5620 | | 17.50 | 17.36 |
| | | 128 | 5640 |] [| 17.50 | 17.34 |
| | | 136 | 5680 |] [| 17.50 | 17.40 |
| | | 140 | 5700 | | 14.50 | 14.37 |
| | | 144 | 5720 | | 14.50 | 14.40 |
| | | 102 | 5510 | | 13.50 | 13.42 |
| | | 110 | 5550 |] [| 16.50 | 16.46 |
| | 802.11n-HT40 | 118 | 5590 | MCS0 | 16.50 | 16.36 |
| | | 126 | 5630 | | 16.50 | 16.35 |
| | | 134 | 5670 | | 16.50 | 16.41 |
| | | 142 | 5710 | | 16.50 | 16.31 |
| | | 102 | 5510 | | 13.50 | 13.37 |
| | | 110 | 5550 | | 16.50 | 16.35 |
| | 802.11n-VHT40 | 118 | 5590 | MCS0 | 16.50 | 16.31 |
| | | 126 | 5630 | | 16.50 | 16.30 |
| | | 134 142 | 5670 5710 | | 16.50 16.50 | 16.40 |
| | | | | | | 16.47 |
| | 802.11n-VHT80 | 106 | 5530 5610 | MCS0 | 11.50 | 11.33 |
| | 002.1111-111100 | 122 138 | 5610 5690 | IVICOU | 16.50 16.50 | 16.30 |
| | | 138 | 2090 | | 10.50 | 16.42 |

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| | Aux Antenna | | | | | | | | |
|--------------|-----------------|---------|--------------------|-----------|--|---------------------------|--|--|--|
| Mode | Mode | Channel | Frequency (MHz) | Data Rate | Max. Rated Avg. Power + Max. Tolerance (dBm) | Average power (dBm) | | | |
| | | 149 | 5745 | | 17.50 | 17.41 | | | |
| | 802.11a | 157 | 5785 | 6Mbps | 17.50 | 17.37 | | | |
| | | 165 | 5825 | | 17.50 | 17.50 | | | |
| | 802.11n-HT20 | 149 | 5745 | MCS0 | 17.50 | 17.30 | | | |
| | | 157 | 5785 | | 17.50 | 17.41 | | | |
| | | 165 | 5825 | | 17.50 | 17.45 | | | |
| 5800 MHz | | 149 | 5745 | | 17.50 | 17.44 | | | |
| 3000 1011 12 | 802.11n-VHT20 | 157 | 5785 | MCS0 | 17.50 | 17.35 | | | |
| | | 165 | 5825 | | 17.50 | 17.39 | | | |
| | 802.11n-HT40 | 151 | 5755 | MCS0 | 16.50 | 16.43 | | | |
| | 002.1111-11140 | 159 | 5795 | IVICOU | 16.50 | 16.46 | | | |
| | 802.11n-VHT40 | 151 | 5755 | MCS0 | 16.50 | 16.38 | | | |
| | 002.1111-711140 | 159 | 5795 | IVICOU | 16.50 | 16.33 | | | |
| | 802.11n-VHT80 | 155 | 5775 | MCS0 | 16.50 | 16.40 | | | |

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Bluetooth conducted power table

| Blactoctii conaactca petroi tabio | | | | | | | | |
|-----------------------------------|-------------------|-------|---------|------------|---------------------------------|-----------------|--|--|
| Mode | Channel Frequency | | Average | Output Pov | Max. Rated Avg. Power + Max. | | | |
| iviode | Charmer | (MHz) | 1Mbps | 2Mbps | 3Mbps | Tolerance (dBm) | | |
| | CH 00 | 2402 | 5.15 | 2.65 | 2.54 | | | |
| BR/EDR | CH 39 | 2441 | 5.32 | 3.19 | 2.78 | 5.5 | | |
| | CH 78 | 2480 | 5.24 | 2.83 | 2.73 | | | |

| Mode | Channel | Frequency | Average Output Power (dBm) | Max. Rated Avg. Power + Max. |
|--------|---------|-----------|----------------------------|---------------------------------|
| iviode | Channel | (MHz) | GFSK | Tolerance (dBm) |
| | CH 00 | 2402 | 2.87 | |
| LE | CH 19 | 2440 | 2.65 | 5.5 |
| | CH 39 | 2480 | 2.43 | |

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1.4 Test Environment

Ambient Temperature: 22±2° C Tissue Simulating Liquid: 22±2° C

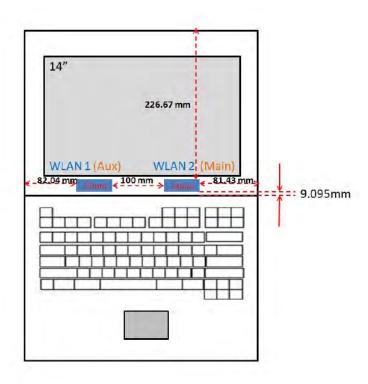
1.5 Operation Description

Use chipset specific software to control the EUT, and makes it transmit in maximum power. Measurements are performed respectively on the lowest, middle and highest channels of the operating band(s). The EUT is set to maximum power level during all tests, and at the beginning of each test the battery is fully charged.

There are three antenna vendors for WLAN antennas, and both of them were measured fully, and respectively. EUT was tested in the following configurations:

Laptop mode

SAR measurement for laptop mode is performed with keyboard bottom touch against the flat phantom.



Antenna location

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Note:

802.11b DSSS SAR Test Requirements:

- 1. SAR is measured for 2.4 GHz 802.11b DSSS mode using the highest measured maximum output power channel, when the reported SAR of the highest measured maximum output power channel for the exposure configuration is ≤ 0.8 W/kg, no further SAR testing is required for 802.11b DSSS in that exposure configuration.
- 2. When the reported SAR is > 0.8 W/kg, SAR is required for that exposure configuration using the next highest measured output power channel. When any reported SAR is > 1.2 W/kg, SAR is required for the third channel; i.e., all channels require testing.

802.11g/n OFDM SAR Test Exclusion Requirements:

 SAR is not required for 802.11g/n when the highest reported SAR for DSSS is adjusted by the ratio of OFDM to DSSS specified maximum output power and the adjusted SAR is ≤ 1.2 W/kg.

Initial Test Configuration:

- 4. An initial test configuration is determined for OFDM transmission modes according to the channel bandwidth, modulation and data rate combination(s) with the highest maximum output power specified for production units in each standalone and aggregated frequency band.
- 5. SAR is measured using the highest measured maximum output power channel. When the reported SAR of the initial test configuration is > 0.8 W/kg, SAR measurement is required for the subsequent next highest measured output power channel(s) in the initial test configuration until the reported SAR is ≤ 1.2 W/kg or all required channels are tested.
- 6. For WLAN Main/Aux antenna, 5.2a / 5.3a / 5.6a / 5.8a are chosen to be the initial test configurations.
- 7. Since the highest reported SAR for the initial test configuration is adjusted by the ratio of the subsequent test configuration to initial test configuration specified maximum output power and the adjusted SAR is < 1.2 W/kg, SAR is not required for subsequent test configuration.
- 8. BT and WLAN Aux use the same antenna path and Bluetooth may transmit simultaneously with WLAN Main.

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9. Based on KDB447498D01, SAR test exclusion is evaluated as below,

| Lap | top Mode | WLAN Main 2.45GHz | WLAN Main 5GHz |
|----------------|-------------------------------|----------------------|-------------------|
| Max. tune- | ·up power(dBm) | 17 | 17.5 |
| Max. tune | -up power(mW) | 50.119 | 56.234 |
| Pottom | Test separation distance (mm) | 9.05 | 9.05 |
| Bottom side | Calculation value | 8.647 | 14.923 |
| | Require SAR testing? | YES | YES |

| Laptop Mode | | WLAN Aux 2.45GHz | WLAN Aux 5GHz | ВТ |
|----------------|-------------------------------|---------------------|------------------|-------|
| Max. tune- | up power(dBm) | 17 | 17.5 | 5.5 |
| Max. tune- | Max. tune-up power(mW) | | 56.234 | 3.548 |
| Pottom | Test separation distance (mm) | 9.05 | 9.05 | 9.05 |
| Bottom side | Calculation value | 8.647 | 14.923 | 0.614 |
| | Require SAR testing? | YES | YES | NO |

- 10. According to KDB447498 D01, testing of other required channels is not required when the reported 1-g SAR for the highest output channel is \leq 0.8 W/kg, when the transmission band is \leq 100 MHz.
- 11. According to KDB865664 D01, SAR measurement variability must be assessed for each frequency band. When the original highest measured SAR is ≥ 0.8 W/kg, repeated that measurement once. Perform a second repeated measurement only if the ratio of largest to smallest SAR for the original and first repeated measurements is > 1.20 or when the original or repeated measurement is ≥ 1.45 W/kg (~ 10% from the 1-g SAR limit)
- 12. For the 2nd battery, worst cases spot check were performed separately for main/aux antennas.

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1.6 The SAR Measurement System

A block diagram of the SAR measurement System is given in Fig. a. This SAR Measurement System uses a Computer-controlled 3-D stepper motor system (SPEAG DASY 5 professional system). The model EX3DV4 field probe is used to determine the internal electric fields. The SAR can be obtained from the equation SAR= σ (|Ei|²)/ ρ where σ and ρ are the conductivity and mass density of the tissue-simulant.

The DASY 5 system for performing compliance tests consists of the following items:

- 1. A standard high precision 6-axis robot (Staubli RX family) with controller, teach pendant and software. An arm extension is for accommodating the data acquisition electronics (DAE).
- A dosimetric probe, i.e., an isotropic E-field probe optimized and calibrated for usage intissue simulating liquid. The probe is equipped with an optical surface detector system.
- 3. A data acquisition electronics (DAE) which performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. The unit is battery powered with standard or rechargeable batteries. The signal is optically transmitted to the EOC.

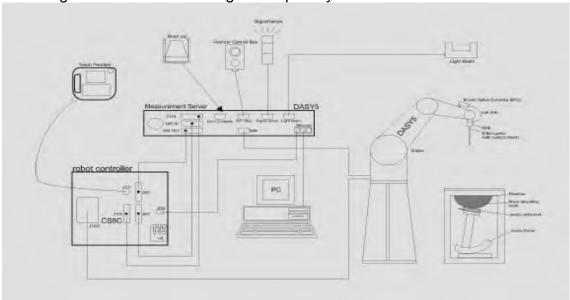


Fig. a The block diagram of SAR system

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- 4. The Electro-optical converter (EOC) performs the conversion between optical and electrical of the signals for the digital communication to the DAE and for the analog signal from the optical surface detection. The EOC is connected to the measurement server.
- 5. The function of the measurement server is to perform the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.
- 6. A probe alignment unit which improves the (absolute) accuracy of the probe positioning.
- 7. A computer operating Windows 7.
- 8. DASY 5 software.
- 9. Remote control with teach pendant and additional circuitry for robot safety such as warning lamps, etc.
- 10. The SAM twin phantom enabling testing left-hand and right-hand usage.
- 11. The device holder for handheld mobile phones.
- 12. Tissue simulating liquid mixed according to the given recipes.
- Validation dipole kits allowing to validate the proper functioning of the system.

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1.7 System Components

EX3DV4 E-Field Probe

| Construction | Symmetrical design with triangular core Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE) | | | | | |
|--------------|--|--|--|--|--|--|
| Calibration | Basic Broad Band Calibration in air Conversion Factors (CF) for HSL 2450/5200/5300/5600/5800 MHz Additional CF for other liquids and frequencies upon request | | | | | |
| Frequency | 10 MHz to > 6 GHz | | | | | |
| Directivity | ± 0.3 dB in HSL (rotation around probe axis) ± 0.5 dB in tissue material (rotation normal to probe axis) | | | | | |
| Dynamic | $10 \mu \text{W/g to} > 100 \text{ mW/g}$ | | | | | |
| Range | Linearity: ± 0.2 dB (noise: typically < 1 μW/g) | | | | | |
| Dimensions | Tip diameter: 2.5 mm | | | | | |
| Application | High precision dosimetric measurements in any exposure scenario (e.g., very strong gradient fields). Only probe which enables compliance testing for frequencies up to 6 GHz with precision of better 30%. | | | | | |

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PHANTOM

| THAITION | | |
|-----------------|---|--|
| Model | ELI | |
| Construction | The ELI phantom is used for complete body-mounted wireless devices in the following standard and all known tissue sime optimized regarding its performance our standard phantom tables. A covoliquid. Reference markings on the placemeasurement grids, by teaching the compatible with all SPEAG dosimeters. | the frequency range of 30 MHz tible with the IEC 62209-2 tulating liquids. ELI has been be and can be integrated into the prevents evaporation of the hantom allow installation of the efined phantom positions and three points. The phantom is |
| Shell Thickness | 2 ± 0.2 mm | |
| Filling Volume | Approx. 30 liters | |
| Dimensions | Major axis: 600 mm | |
| | Minor axis: 400 mm | |

DEVICE HOLDER

| Construction | The device holder (Supporter) for Notebook is made by POM (polyoxymethylene resin), which is non-metal and non-conductive. The height can be adjusted to fit varies kind of notebooks. | |
|--------------|--|---------------|
| | | Device Holder |

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1.8 SAR System Verification

The microwave circuit arrangement for system verification is sketched in Fig. b. The daily system accuracy verification occurs within the flat section of the SAM phantom. A SAR measurement was performed to see if the measured SAR was within +/- 10% from the target SAR values. These tests were done at 2450/5200/ 5300/5600/5800MHz. The tests were conducted on the same days as the measurement of the DUT. The obtained results from the system accuracy verification are displayed in the table 1 (SAR values are normalized to 1W forward power delivered to the dipole). During the tests, the liquid depth above the ear reference points was \geq 15 cm \pm 5 mm (frequency \leq 3 GHz) or \geq 10 cm \pm 5 mm (frequency > 3 G Hz) in all the cases. It is seen that the system is operating within its specification, as the results are within acceptable tolerance of the reference values.

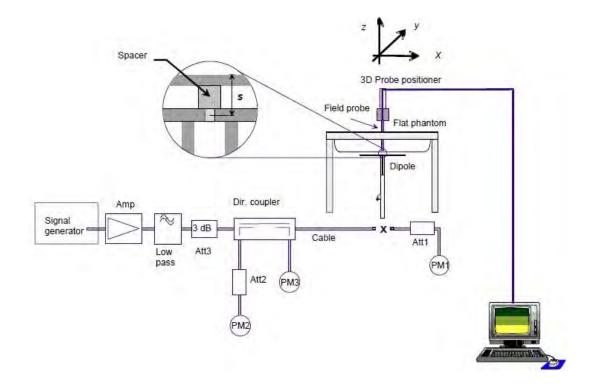


Fig. b The block diagram of system verification

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| Validation Kit | S/N | Frequency (MHz) | | 1W Target SAR-1g (mW/g) | Measured SAR-1g (mW/g) | Measured SAR-1g normalized to 1W (mW/g) | Deviation (%) | Measured Date |
|-------------------|------|--------------------|-----------|-------------------------------|------------------------------|--|---------------|------------------|
| D2450V2 | 727 | 2450 | Body | 50.6 | 12.8 | 51.2 | 1.19% | Oct. 24, 2017 |
| D2430 V Z | 121 | 7 2450 | Body | 50.8 | 13.3 | 53.2 | 4.72% | Jun. 11, 2018 |
| | | 5200 | Body | 72.8 | 7.22 | 72.2 | -0.82% | Oct. 27, 2017 |
| | | | | 70.9 | 7.44 | 74.4 | 4.94% | Jun. 12, 2018 |
| | | 5300 | 5300 Body | 76.1 | 7.55 | 75.5 | -0.79% | Nov. 04, 2017 |
| D5GHzV2 | 1023 | 3300 | | 72.9 | 7.48 | 74.8 | 2.61% | Jun. 13, 2018 |
| DOGHZVZ | | 5600 | 600 Body | 79.6 | 8.31 | 83.1 | 4.40% | Nov. 10, 2017 |
| | | | | 77.6 | 8.15 | 81.5 | 5.03% | Jun. 14, 2018 |
| | | 5800 | Pody | 75.9 | 7.91 | 79.1 | 4.22% | Nov. 05, 2017 |
| | | 3800 | 5800 Body | 74.1 | 7.71 | 77.1 | 4.05% | Jun. 15, 2018 |

Table 1. Results of system validation

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1.9 Tissue Simulant Fluid for the Frequency Band

The dielectric properties for this body-simulant fluid were measured by using the Agilent Model 85070E Dielectric Probe (rates frequency band 200 MHz to 20 GHz) in conjunction with Network Analyzer (30 KHz-6000 MHz).

All dielectric parameters of tissue simulates were measured within 24 hours of SAR measurements. The measured conductivity and permittivity are all within ± 5% of the target values.

| Tissue Type | Measurement Date | Measured Frequency (MHz) | Target Dielectric Constant, εr | Target Conductivity, σ (S/m) | Measured Dielectric Constant, εr | Measured Conductivity, σ (S/m) | % dev ɛr | % dev σ |
|----------------|---------------------|--------------------------------|--------------------------------|------------------------------------|----------------------------------|--------------------------------------|----------|---------|
| | | 2412 | 52.751 | 1.914 | 52.536 | 1.938 | 0.41% | -1.28% |
| | | 2437 | 52.717 | 1.938 | 52.478 | 1.971 | 0.45% | -1.74% |
| | Oct. 24, 2017 | 2441 | 52.712 | 1.941 | 52.473 | 1.978 | 0.45% | -1.89% |
| | | 2450 | 52.700 | 1.950 | 52.461 | 1.985 | 0.45% | -1.81% |
| | | 2462 | 52.685 | 1.967 | 52.389 | 2.003 | 0.56% | -1.84% |
| | Oct. 27, 2017 | 5200 | 49.014 | 5.299 | 49.726 | 5.153 | -1.45% | 2.76% |
| | Nov. 04, 2017 | 5260 | 48.933 | 5.369 | 50.039 | 5.336 | -2.26% | 0.62% |
| Body | | 5300 | 48.879 | 5.416 | 49.974 | 5.380 | -2.24% | 0.67% |
| Body | Nov. 05, 2017 | 5520 | 48.580 | 5.673 | 47.772 | 5.636 | 1.66% | 0.66% |
| | | 5580 | 48.499 | 5.743 | 47.689 | 5.706 | 1.67% | 0.65% |
| | | 5600 | 48.471 | 5.766 | 47.658 | 5.730 | 1.68% | 0.64% |
| | | 5680 | 48.363 | 5.860 | 47.547 | 5.825 | 1.69% | 0.60% |
| | | 5745 | 48.275 | 5.936 | 47.041 | 6.033 | 2.56% | -1.64% |
| | Nov. 05, 2017 | 5785 | 48.220 | 5.982 | 46.989 | 6.080 | 2.55% | -1.63% |
| | 1100. 03, 2017 | 5800 | 48.200 | 6.000 | 46.974 | 6.097 | 2.54% | -1.62% |
| | | 5825 | 48.166 | 6.029 | 46.946 | 6.126 | 2.53% | -1.61% |

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| Tissue Type | Measurement Date | Measured Frequency (MHz) | Target Dielectric Constant, εr | Target Conductivity, σ (S/m) | Measured Dielectric Constant, εr | Measured Conductivity, σ (S/m) | % dev εr | % dev σ |
|----------------|---------------------|--------------------------------|--------------------------------|------------------------------------|----------------------------------|--------------------------------------|----------|---------|
| | | 2412 | 52.751 | 1.914 | 53.706 | 1.920 | -1.81% | -0.33% |
| | Jun, 11. 2018 | 2437 | 52.717 | 1.938 | 53.609 | 1.951 | -1.69% | -0.69% |
| | Juli, 11. 2016 | 2450 | 52.700 | 1.950 | 53.582 | 1.967 | -1.67% | -0.87% |
| | | 2462 | 52.685 | 1.967 | 53.547 | 1.986 | -1.64% | -0.97% |
| | | 5180 | 49.041 | 5.276 | 49.431 | 5.108 | -0.79% | 3.18% |
| | Jun, 12. 2018 | 5200 | 49.014 | 5.299 | 49.339 | 5.138 | -0.66% | 3.04% |
| | | 5220 | 48.987 | 5.323 | 49.278 | 5.167 | -0.59% | 2.92% |
| | | 5240 | 48.960 | 5.346 | 49.175 | 5.208 | -0.44% | 2.58% |
| | | 5260 | 48.933 | 5.369 | 49.110 | 5.248 | -0.36% | 2.26% |
| Body | Jun. 13. 2018 | 5280 | 48.906 | 5.393 | 49.062 | 5.276 | -0.32% | 2.16% |
| Dody | Juli, 13. 2016 | 5300 | 48.879 | 5.416 | 49.032 | 5.307 | -0.31% | 2.01% |
| | | 5320 | 48.851 | 5.439 | 48.944 | 5.337 | -0.19% | 1.88% |
| | | 5520 | 48.580 | 5.673 | 48.305 | 5.661 | 0.57% | 0.21% |
| | Jun, 14. 2018 | 5580 | 48.499 | 5.743 | 48.093 | 5.776 | 0.84% | -0.57% |
| | Juli, 14. 2016 | 5600 | 48.471 | 5.766 | 48.043 | 5.798 | 0.88% | -0.55% |
| | | 5680 | 48.363 | 5.860 | 47.801 | 5.943 | 1.16% | -1.42% |
| | | 5745 | 48.275 | 5.936 | 47.596 | 6.035 | 1.41% | -1.67% |
| | Jun. 15. 2018 | 5785 | 48.220 | 5.982 | 47.424 | 6.104 | 1.65% | -2.03% |
| | Juli, 13. 2010 | 5800 | 48.200 | 6.000 | 47.395 | 6.131 | 1.67% | -2.18% |
| | | 5825 | 48.166 | 6.029 | 47.391 | 6.165 | 1.61% | -2.25% |

Table 2. Dielectric Parameters of Tissue Simulant Fluid

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The composition of the tissue simulating liquid:

| The composition are access carriagating inquitar | | | | | | | | | |
|--|--------------------|------|------------|---------|------|------------------|-----------|-------|-----------------|
| | | | Ingredient | | | | | | Tatal |
| | Frequency (MHz) | Mode | DGMBE | Water | Salt | Preventol D-7 | Cellulose | Sugar | Total amount |
| | 2450M | Body | 301.7ml | 698.3ml | _ | _ | _ | _ | 1.0L(Kg) |

Body Simulating Liquids for 5 GHz, Manufactured by SPEAG:

| | 3 | , | <i>j</i> |
|---------------|-------|---------------------------------|-----------------|
| Ingredients | Water | Esters, Emulsifiers, Inhibitors | Sodium and Salt |
| (% by weight) | 60-80 | 20-40 | 0-1.5 |

Table 3. Recipes for Tissue Simulating Liquid

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1.10 Evaluation Procedures

The entire evaluation of the spatial peak values is performed within the Post-processing engine (SEMCAD). The system always gives the maximum values for the 1 g and 10 g cubes. The algorithm to find the cube with highest averaged SAR is divided into the following stages:

- 1. The extraction of the measured data (grid and values) from the Zoom Scan.
- 2. The calculation of the SAR value at every measurement point based on all stored data (A/D values and measurement parameters)
- 3. The generation of a high-resolution mesh within the measured volume
- 4. The interpolation of all measured values from the measurement grid to the high-resolution grid
- 5. The extrapolation of the entire 3-D field distribution to the phantom surface over the distance from sensor to surface
- 6. The calculation of the averaged SAR within masses of 1g and 10g.

The probe is calibrated at the center of the dipole sensors that is located 1 to 2.7mm away from the probe tip. During measurements, the probe stops shortly above the phantom surface, depending on the probe and the surface detecting system. Both distances are included as parameters in the probe configuration file. The software always knows exactly how far away the measured point is from the surface. As the probe cannot directly measure at the surface, the values between the deepest measured point and the surface must be extrapolated. The angle between the probe axis and the surface normal line is less than 30 degree.

In the Area Scan, the gradient of the interpolation function is evaluated to find all the extreme of the SAR distribution. The uncertainty on the locations of the extreme is less than 1/20 of the grid size. Only local maximum within –2 dB of the global maximum are searched and passed for the Cube Scan measurement. In the Cube Scan, the interpolation function is used to extrapolate the Peak SAR from the lowest measurement points to the inner phantom surface (the extrapolation distance). The uncertainty increases with the extrapolation distance. To keep the uncertainty within 1% for the 1 g and 10 g cubes, the extrapolation distance should not be larger than 5mm.

The maximum search is automatically performed after each area scan measurement. It is based on splines in two or three dimensions. The procedure can find the maximum for most SAR distributions even with relatively large grid spacing. After the area scanning measurement, the probe is automatically moved to a position at the interpolated maximum. The following scan can directly use this position for reference, e.g., for a finer resolution grid or the cube evaluations. The 1g and 10g peak evaluations are only available for the predefined cube 7x7x7 scans. The routines are verified and optimized for the grid dimensions used in these cube measurements.

The measured volume of 30x30x30mm contains about 30g of tissue.

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The first procedure is an extrapolation (incl. Boundary correction) to get the points between the lowest measured plane and the surface. The next step uses 3D interpolation to get all points within the measured volume. In the last step, a 1g cube is placed numerically into the volume and its averaged SAR is calculated. This cube is the moved around until the highest averaged SAR is found. If the highest SAR is found at the edge of the measured volume, the system will issue a warning: higher SAR values might be found outside of the measured volume. In that case the cube measurement can be repeated, using the new interpolated maximum as the center.

1.11 Probe Calibration Procedures

For the calibration of E-field probes in lossy liquids, an electric field with an accurately known field strength must be produced within the measured liquid. For standardization purposes it would be desirable if all measurements which are necessary to assess the correct field strength would be traceable to standardized measurement procedures. In the following two different calibration techniques are summarized:

1.11.1 Transfer Calibration with Temperature Probes

In lossy liquids the specific absorption rate (SAR) is related both to the electric field (E) and the temperature gradient ($\delta T / \delta t$) in the liquid.

$$SAR = \frac{\sigma}{\rho} |E|^2 = c \frac{\delta T}{\delta t}$$

whereby $\boldsymbol{\sigma}$ is the conductivity, $\boldsymbol{\rho}$ the density and \boldsymbol{c} the heat capacity of the liquid.

Hence, the electric field in lossy liquid can be measured indirectly by measuring the temperature gradient in the liquid. Non-disturbing temperature probes (optical probes or thermistor probes with resistive lines) with high spatial resolution (<1-2 mm) and fast reaction time (<1 s) are available and can be easily calibrated with high precision [1]. The setup and the exciting source have no influence on the calibration; only the relative positioning uncertainties of the standard temperature probe and the E-field probe to be calibrated must be considered. However, several problems limit the available accuracy of probe calibrations with temperature probes:

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• The temperature gradient is not directly measurable but must be evaluated from temperature measurements at different time steps. Special precaution is necessary to avoid measurement errors caused by temperature gradients due to energy equalizing effects or convection currents in the liquid. Such effects cannot be completely avoided, as the measured field itself destroys the thermal equilibrium in the liquid. With a careful setup these errors can be kept small.

- The measured volume around the temperature probe is not well defined. It is difficult to calculate the energy transfer from a surrounding gradient temperature field into the probe. These effects must be considered, since temperature probes are calibrated in liquid with homogeneous temperatures. There is no traceable standard for temperature rise measurements.
- The calibration depends on the assessment of the specific density, the heat capacity and the conductivity of the medium. While the specific density and heat capacity can be measured accurately with standardized procedures ($\sim 2\%$ for c; much better for ρ), there is no standard for the measurement of the conductivity. Depending on the method and liquid, the error can well exceed ±5%.
- Temperature rise measurements are not very sensitive and therefore are often performed at a higher power level than the E-field measurements. The nonlinearities in the system (e.g., power measurements, different components, etc.) must be considered.

Considering these problems, the possible accuracy of the calibration of E-field probes with temperature gradient measurements in a carefully designed setup is about ±10% (RSS) [2]. Recently, a setup which is a combination of the waveguide techniques and the thermal measurements was presented in [3]. The estimated uncertainty of the setup is ±5% (RSS) when the same liquid is used for the calibration and for actual measurements and ±7-9% (RSS) when not, which is in good agreement with the estimates given in [2].

1.11.2 Calibration with Analytical Fields

In this method a technical setup is used in which the field can be calculated analytically from measurements of other physical magnitudes (e.g., input power). This corresponds to the standard field method for probe calibration in air; however, there is no standard defined for fields in lossy liquids. When using calculated fields in lossy liquids for probe calibration, several points must be considered in the assessment of the uncertainty:

- The setup must enable accurate determination of the incident power.
- The accuracy of the calculated field strength will depend on the assessment of the dielectric parameters of the liquid.

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 Due to the small wavelength in liquids with high permittivity, even small setups might be above the resonant cutoff frequencies. The field distribution in the setup must be carefully checked for conformity with the theoretical field distribution.

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1.12 Test Standards and Limits

According to FCC 47CFR §2.1093(d) The limits to be used for evaluation are based generally on criteria published by the American National Standards Institute (ANSI) for localized specific absorption rate ("SAR") in Section 4.2 of "IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz," ANSI/IEEE C95.1, By the Institute of Electrical and Electronics Engineers, Inc., New York, New York 10017. These criteria for SAR evaluation are similar to those recommended by the National Council on Radiation Protection and Measurements (NCRP) in "Biological Effects and Exposure Criteria for Radio frequency Electromagnetic Fields," NCRP Report No. 86, Section 17.4.5. Copyright NCRP, 1986, Bethesda, Maryland 20814. SAR is a measure of the rate of energy absorption due to exposure to an RF transmitting source. SAR values have been related to threshold levels for potential biological hazards. The criteria to be used are specified in paragraphs (d)(1) and (d)(2) of this section and shall apply for portable devices transmitting in the frequency range from 100 kHz to 6 GHz. Portable devices that transmit at frequencies above 6 GHz are to be evaluated in terms of the MPE limits specified in § 1.1310 of this chapter. Measurements and calculations to demonstrate compliance with MPE field strength or power density limits for devices operating above 6 GHz should be made at a minimum distance of 5 cm from the radiating source.

- (1) Limits for Occupational/Controlled exposure: 0.4 W/kg as averaged over the whole-body and spatial peak SAR not exceeding 8 W/kg as averaged over any 1 gram of tissue (defined as a tissue volume in the shape of a cube). Exceptions are the hands, wrists, feet and ankles where the spatial peak SAR shall not exceed 20 W/kg, as averaged over an 10 grams of tissue (defined as a tissue volume in the shape of a cube).
- (2) Occupational/Controlled limits apply when persons are exposed as a consequence of their employment provided these persons are fully aware of and exercise control over their exposure. Awareness of exposure can be accomplished by use of warning labels or by specific training or education through appropriate means, such as an RF safety program in a work environment.
- (3) Limits for General Population/Uncontrolled exposure: 0.08 W/kg as averaged over the whole-body and spatial peak SAR not exceeding 1.6 W/kg as averaged over any 1 gram of tissue (defined as a tissue volume in the shape of a cube). Exceptions are the hands, wrists, feet and ankles where the spatial peak SAR shall not exceed 4 W/kg, as averaged over any 10 grams of tissue (defined as a tissue volume in the shape of a cube). General Population/Uncontrolled limits apply when the general public may be exposed, or when persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or do not exercise control over their exposure. Warning labels placed on consumer devices such as cellular telephones will not be sufficient reason to allow these devices to be evaluated subject to limits for occupational/controlled exposure in paragraph

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(d)(1) of this section. (Table 4.)

| Human Exposure | Uncontrolled Environment General Population | Controlled Environment Occupational |
|---|---|--|
| Spatial Peak SAR (Brain) | 1.60 W/kg | 8.00 W/kg |
| Spatial Average SAR (Whole Body) | 0.08 W/kg | 0.40 W/kg |
| Spatial Peak SAR (Hands/Feet/Ankle/Wrist) | 4.00 W/kg | 20.00 W/kg |

Table 4. RF exposure limits

Notes:

- 1. Uncontrolled environments are defined as locations where there is potential exposure of individuals who have no knowledge or control of their potential exposure.
- Controlled environments are defined as locations where there is potential exposure of individuals who have knowledge of their potential exposure and can exercise control over their exposure.

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2. Summary of Results

WNC Antenna

WLAN Main Antenna (Laptop mode)

| VVLAI | n Maili Alitelli | ια (Lαριυ | р шос | 10 <i>)</i> | | | | | | | |
|---------|--------------------|--------------|---------------|-------------|-----------|---------------------------------|------------------------|---------|----------|--------------------|------|
| Antenna | Mode | Position | Distance (mm) | СН | Freq. | Max. Rated Avg. Power + Max. | Measured Avg. Power | Scaling | | AR over 1g (kg) | Plot |
| | | | (111111) | | (1711 12) | Tolerance (dBm) | (dBm) | | Measured | Reported | page |
| | WLAN802.11 b | Bottom side | 0 | 11 | 2462 | 17 | 16.93 | 101.62% | 0.243 | 0.247 | 52 |
| | WLAN802.11 g | Bottom side | 0 | 6 | 2437 | 18 | 17.90 | 102.33% | 0.321 | 0.328 | 53 |
| | WLAN802.11 a 5.2G | Bottom side | 0 | 40 | 5200 | 17.5 | 17.43 | 101.62% | 0.353 | 0.359 | 54 |
| Main | WLAN802.11 a 5.3G | Bottom side | 0 | 52 | 5260 | 17.5 | 17.47 | 100.69% | 0.365 | 0.368 | 55 |
| | WLAN802.11 a 5.6G | Bottom side | 0 | 116 | 5580 | 17.5 | 17.43 | 101.62% | 0.495 | 0.503 | 56 |
| | WI ANION 11 o F 90 | Bottom side | 0 | 157 | 5785 | 17.5 | 17.48 | 100.46% | 0.637 | 0.640 | 57 |
| | WLAN802.11 a 5.8G | Bottom side* | 0 | 157 | 5785 | 17.5 | 17.48 | 100.46% | 0.612 | 0.615 | - |

^{* - 2&}lt;sup>nd</sup> battery

WLAN Aux Antenna (Laptop mode)

| Antenna | Mode | Position | Distance (mm) | СН | Freq. | Max. Rated Avg. Power + Max. | Measured Avg. Power | Scaling | Averaged SAR over (W/kg) | | Plot page |
|---------|-------------------|--------------|---------------|-----|-----------|---------------------------------|------------------------|---------|--------------------------|----------|-----------|
| | | | (111111) | | (1711 12) | Tolerance (dBm) | (dBm) | | Measured | Reported | page |
| | WLAN802.11 b | Bottom side | 0 | 1 | 2412 | 17 | 16.97 | 100.69% | 0.345 | 0.347 | 58 |
| | | Bottom side | 0 | 1 | 2412 | 14 | 13.92 | 101.86% | 0.173 | 0.176 | - |
| | WLAN802.11 g | Bottom side | 0 | 6 | 2437 | 18 | 17.85 | 103.51% | 0.415 | 0.430 | 59 |
| | | Bottom side | 0 | 11 | 2462 | 15 | 14.89 | 102.57% | 0.229 | 0.235 | - |
| | WLAN802.11 a 5.2G | Bottom side | 0 | 40 | 5200 | 17.5 | 17.43 | 101.62% | 0.602 | 0.612 | 60 |
| Aux | WLAN802.11 a 5.3G | Bottom side | 0 | 52 | 5260 | 17.5 | 17.49 | 100.23% | 0.488 | 0.489 | 61 |
| | | Bottom side | 0 | 104 | 5520 | 17.5 | 17.46 | 100.93% | 0.707 | 0.714 | 62 |
| | WLAN802.11 a 5.6G | Bottom side* | 0 | 104 | 5520 | 17.5 | 17.46 | 100.93% | 0.656 | 0.662 | - |
| | WLAN602.11 a 5.6G | Bottom side | 0 | 116 | 5520 | 17.5 | 17.34 | 103.75% | 0.633 | 0.657 | - |
| | | Bottom side | 0 | 136 | 5520 | 17.5 | 17.42 | 101.86% | 0.615 | 0.626 | - |
| | WLAN802.11 a 5.8G | Bottom side | 0 | 149 | 5745 | 17.5 | 17.47 | 100.69% | 0.534 | 0.538 | 63 |

^{* - 2&}lt;sup>nd</sup> battery

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ACON Antenna

WLAN Main Antenna (Laptop mode)

| Antenna | Mode | Position | Distance (mm) | CH | Freq. (MHz) | Max. Rated Avg. Power + Max. | Measured Avg. Power | Scaling | Averaged SAR over 1g (W/kg) | | Plot |
|---------|----------------------|--------------|---------------|-----|----------------|---------------------------------|------------------------|---------|--------------------------------|----------|------|
| | | | (111111) | | (1411 12) | Tolerance (dBm) (dB | (dBm) | | Measured | Reported | page |
| | WLAN802.11 b | Bottom side | 0 | 11 | 2462 | 17 | 16.93 | 101.62% | 0.236 | 0.240 | 64 |
| | WLAN802.11 g | Bottom side | 0 | 6 | 2437 | 18 | 17.90 | 102.33% | 0.282 | 0.289 | 65 |
| | WLAN802.11 a 5.2G | Bottom side | 0 | 40 | 5200 | 17.5 | 17.43 | 101.62% | 0.449 | 0.456 | 66 |
| | WLAN802.11 a 5.3G | Bottom side | 0 | 52 | 5260 | 17.5 | 17.47 | 100.69% | 0.465 | 0.468 | 67 |
| Main | WLAN802.11 a 5.6G | Bottom side | 0 | 116 | 5580 | 17.5 | 17.43 | 101.62% | 0.560 | 0.569 | 68 |
| | | Bottom side | 0 | 149 | 5745 | 17.5 | 17.34 | 103.75% | 0.489 | 0.507 | - |
| | W/I ANI902 11 o E 90 | Bottom side | 0 | 157 | 5785 | 17.5 | 17.48 | 100.46% | 0.567 | 0.570 | 69 |
| | ⊢ | Bottom side* | 0 | 157 | 5785 | 17.5 | 17.48 | 100.46% | 0.529 | 0.531 | - |
| | | Bottom side | 0 | 165 | 5825 | 17.5 | 17.36 | 103.28% | 0.457 | 0.472 | - |

^{* - 2&}lt;sup>nd</sup> battery

WLAN Aux Antenna (Laptop mode)

| Antenna | Mode | Position | Distance (mm) | СН | Freq. (MHz) | Max. Rated Avg. Power + Max. | Measured Avg. Power | Scaling | Averaged SAR over 1g (W/kg) | | Plot page |
|---------|-------------------|--------------|---------------|-----|----------------|---------------------------------|------------------------|---------|--------------------------------|----------|--------------|
| | | | (11111) | | (1011 12) | Tolerance (dBm) | (dBm) | | Measured | Reported | page |
| | WLAN802.11 b | Bottom side | 0 | 1 | 2412 | 17 | 16.97 | 100.69% | 0.104 | 0.105 | 70 |
| | | Bottom side | 0 | 1 | 2412 | 14 | 13.92 | 101.86% | 0.259 | 0.264 | - |
| | WLAN802.11 g | Bottom side | 0 | 6 | 2437 | 18 | 17.85 | 103.51% | 0.411 | 0.425 | 71 |
| | | Bottom side* | 0 | 6 | 2437 | 18 | 17.85 | 103.51% | 0.409 | 0.423 | - |
| Aux | | Bottom side | 0 | 11 | 2462 | 15 | 14.89 | 102.57% | 0.321 | 0.329 | - |
| | WLAN802.11 a 5.2G | Bottom side | 0 | 40 | 5200 | 17.5 | 17.43 | 101.62% | 0.417 | 0.424 | 72 |
| | WLAN802.11 a 5.3G | Bottom side | 0 | 52 | 5260 | 17.5 | 17.49 | 100.23% | 0.436 | 0.437 | 73 |
| | WLAN802.11 a 5.6G | Bottom side | 0 | 104 | 5520 | 17.5 | 17.46 | 100.93% | 0.449 | 0.453 | 74 |
| | WLAN802.11 a 5.8G | Bottom side | 0 | 149 | 5745 | 17.5 | 17.47 | 100.69% | 0.469 | 0.472 | 75 |

^{- 2&}lt;sup>nd</sup> battery

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Hong-Bo Antenna

WLAN Main Antenna (Laptop mode)

| Antenna | Mode | Position | Distance (mm) | СН | Freq. (MHz) | Max. Rated Avg. Power + Max. | Measured Avg. Power | Scaling | Averaged SAR over 1g (W/kg) | | Plot page |
|---------|-------------------|---------------|---------------|-----|----------------|---------------------------------|------------------------|---------|--------------------------------|----------|-----------|
| | | | (11111) | | (1711 12) | Tolerance (dBm) | (dBm) | | Measured | Reported | page |
| | WLAN802.11 b | Bottom side | 0 | 6 | 2437 | 17 | 16.98 | 100.46% | 0.370 | 0.372 | 76 |
| | | Bottom side | 0 | 1 | 2412 | 14 | 13.98 | 100.46% | 0.156 | 0.157 | - |
| | WLAN802.11 g | Bottom side | 0 | 6 | 2437 | 18 | 18.00 | 100.00% | 0.460 | 0.460 | 77 |
| | | Bottom side | 0 | 11 | 2462 | 15 | 14.88 | 102.80% | 0.225 | 0.231 | - |
| | WLAN802.11 a 5.2G | Bottom side | 0 | 40 | 5200 | 17.5 | 17.50 | 100.00% | 0.364 | 0.364 | 78 |
| Main | WLAN802.11 a 5.3G | Bottom side | 0 | 52 | 5260 | 17.5 | 17.50 | 100.00% | 0.322 | 0.322 | 79 |
| IVIAIII | WLAN802.11 a 5.6G | Bottom side | 0 | 116 | 5580 | 17.5 | 17.50 | 100.00% | 0.496 | 0.496 | 80 |
| | | Bottom side | 0 | 149 | 5745 | 17.5 | 17.48 | 100.46% | 0.847 | 0.851 | - |
| | | Bottom side | 0 | 157 | 5785 | 17.5 | 17.50 | 100.00% | 0.879 | 0.879 | 81 |
| | WLAN802.11 a 5.8G | Bottom side** | 0 | 157 | 5785 | 17.5 | 17.50 | 100.00% | 0.870 | 0.870 | - |
| | | Bottom side* | 0 | 157 | 5785 | 17.5 | 17.50 | 100.00% | 0.861 | 0.861 | - |
| | | Bottom side | 0 | 165 | 5825 | 17.5 | 17.42 | 101.86% | 0.762 | 0.776 | - |

^{* - 2&}lt;sup>nd</sup> battery

WLAN Aux Antenna (Laptop mode)

| Antenna | Mode | Position | Distance (mm) | СН | Freq. (MHz) | Max. Rated Avg. Power + Max. | Measured Avg. Power | Scaling | Averaged SAR over 1g (W/kg) | | Plot page |
|---------|-------------------|--------------|---------------|-----|----------------|---------------------------------|------------------------|---------|--------------------------------|----------|--------------|
| | | | (111111) | (| (1011 12) | Tolerance (dBm) | (dBm) | | Measured | Reported | page |
| | WLAN802.11 b | Bottom side | 0 | 1 | 2412 | 17 | 17.00 | 100.00% | 0.371 | 0.371 | 82 |
| | | Bottom side | 0 | 1 | 2412 | 14 | 14.00 | 100.00% | 0.159 | 0.159 | - |
| | WLAN802.11 g | Bottom side | 0 | 6 | 2437 | 18 | 17.96 | 100.93% | 0.459 | 0.463 | 83 |
| | | Bottom side | 0 | 11 | 2462 | 15 | 14.98 | 100.46% | 0.254 | 0.255 | - |
| | | Bottom side | 0 | 36 | 5180 | 16.5 | 16.50 | 100.00% | 0.532 | 0.532 | - |
| Aux | | Bottom side | 0 | 40 | 5200 | 17.5 | 17.50 | 100.00% | 0.654 | 0.654 | 84 |
| Aux | WLAN802.11 a 5.2G | Bottom side* | 0 | 40 | 5200 | 17.5 | 17.50 | 100.00% | 0.650 | 0.650 | - |
| | | Bottom side | 0 | 44 | 5220 | 17.5 | 17.49 | 100.23% | 0.621 | 0.622 | - |
| | | Bottom side | 0 | 48 | 5240 | 17.5 | 17.44 | 101.39% | 0.642 | 0.651 | - |
| | WLAN802.11 a 5.3G | Bottom side | 0 | 52 | 5260 | 17.5 | 17.50 | 100.00% | 0.400 | 0.400 | 85 |
| | WLAN802.11 a 5.6G | Bottom side | 0 | 104 | 5520 | 17.5 | 17.50 | 100.00% | 0.640 | 0.640 | 86 |
| | WLAN802.11 a 5.8G | Bottom side | 0 | 165 | 5825 | 17.5 | 17.50 | 100.00% | 0.347 | 0.347 | 87 |

^{- 2&}lt;sup>nd</sup> battery

Note:

Scaling = $\frac{\text{reported SAR}}{\text{measured SAR}} = \frac{\text{P2(mVV)}}{\text{P1(mVV)}} = 10^{\left(\frac{P_0 - P_1}{40}\right)(\text{dBm})}$

Reported SAR = measured SAR * (scaling)

Where P2 is maximum specified power, P1 is measured conducted power

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^{** -} repeated at the highest SAR measurement according to the KDB 865664 D01



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3. Simultaneous Transmission Analysis

Simultaneous Transmission Scenarios:

| Simultaneous Transmit Configurations | Body |
|--------------------------------------|------|
| 2.4GHz WLAN MIMO | Yes |
| 5GHz WLAN MIMO | Yes |
| BT + 2.4GHz WLAN Main | Yes |
| BT + 5GHz WLAN Main | Yes |

Note:

- 1. Bluetooth and WLAN Aux share the same antenna path, and BT can transmit with WLAN Main simultaneously.
- 2. For 2.4/5GHz WLAN Main and Aux antennas, the maximum output power of each antenna during simultaneous transmission (for 802.11n/ac) is the same with or less than that used in standalone transmission (for 802.11a/b/g/n/ac), and we used the sum of 1-g SAR provision in KDB447498D01 to exclude the SAR measurement for 802.11n/ac MIMO.

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3.1 Estimated SAR calculation

According to KDB447498 D01v06 - When standalone SAR test exclusion applies to an antenna that transmits simultaneously with other antennas, the standalone SAR must be estimated according to following to determine simultaneous transmission SAR test exclusion:

Estimated SAR =
$$\frac{\text{Max.tune up power (mW)}}{\text{Min.test separation distance(mm)}} \times \frac{\sqrt{f(GHz)}}{7.5}$$

If the minimum test separation distance is < 5mm, a distance of 5mm is used for estimated SAR calculation. When the test separation distance is >50mm, the 0.4W/kg is used for SAR-1g.

| Mode / Band | position | test separation distance | Estimated SAR(W/kg) |
|-------------|-------------|--------------------------|---------------------|
| BT | bottom side | 9.095mm | 0.082 |

3.2 SPLSR evaluation and analysis

Per KDB447498D01, when the sum of SAR is larger than the limit, SAR test exclusion is determined by the SAR sum to peak location separation ratio(SPLSR).

The simultaneous transmitting antennas in each operating mode and exposure condition combination must be considered one pair at a time to determine the SAR to peak location separation ratio to qualify for test exclusion.

The ratio is determined by (SAR1 + SAR2)^1.5/Ri, rounded to two decimal digits, and must be ≤ 0.04 for all antenna pairs in the configuration to qualify for 1-g SAR test exclusion.

SAR1 and SAR2 are the highest reported or estimated SAR for each antenna in the pair, and Ri is the separation distance between the peak SAR locations for the antenna pair in mm.

When standalone test exclusion applies, SAR is estimated; the peak location is assumed to be at the feed-point or geometric center of the antenna.

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WNC Antenna:

2.4 GHz WLAN MIMO (Laptop Mode)

| = | | <u> </u> | | -, | | | |
|---|-----|---------------------------------|-------------|----------------------|------------------|---------|---------------------------|
| | No. | Conditions | Position | Max. WLAN Main | Max. WLAN Aux | SAR Sum | SPLSR |
| | 1 | 2.4 GHz WLAN Main + WLAN Aux | Bottom side | 0.328 | 0.347 | 0.675 | ΣSAR<1.6, Not required |

5 GHz WLAN MIMO (Laptop Mode)

| No. | Conditions | Position | Max. WLAN Main | Max. WLAN Aux | SAR Sum | SPLSR |
|-----|-------------------------------|-------------|----------------------|------------------|---------|---------------------------|
| 2 | 5 GHz WLAN Main + WLAN Aux | Bottom side | 0.640 | 0.714 | 1.354 | ΣSAR<1.6, Not required |

2.4 GHz WLAN Main + BT (Laptop Mode)

| No. | Conditions | Position | Max. WLAN Main | ВТ | SAR Sum | SPLSR |
|-----|---------------------------|-------------|----------------------|-------|---------|---------------------------|
| 3 | 2.4 GHz WLAN Main + BT | Bottom side | 0.328 | 0.082 | 0.410 | ΣSAR<1.6, Not required |

5 GHz WLAN Main + BT (Laptop Mode)

| No. | Conditions | Position | Max. WLAN Main | ВТ | SAR Sum | SPLSR |
|-----|-------------------------|-------------|----------------------|-------|---------|---------------------------|
| 4 | 5 GHz WLAN Main + BT | Bottom side | 0.640 | 0.082 | 0.722 | ΣSAR<1.6, Not required |

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ACON Antenna:

2.4 GHz WLAN MIMO (Laptop Mode)

| | • | Laptop moa | - / | | | |
|----|---------------------------------|-------------|----------------------|------------------|---------|---------------------------|
| No | c. Conditions | Position | Max. WLAN Main | Max. WLAN Aux | SAR Sum | SPLSR |
| 5 | 2.4 GHz WLAN Main + WLAN Aux | Bottom side | 0.289 | 0.425 | 0.714 | ΣSAR<1.6, Not required |

5 GHz WLAN MIMO (Laptop Mode)

| No. | Conditions | Position | Max. WLAN Main | Max. WLAN Aux | SAR Sum | SPLSR |
|-----|-------------------------------|-------------|----------------------|------------------|---------|---------------------------|
| 6 | 5 GHz WLAN Main + WLAN Aux | Bottom side | 0.570 | 0.472 | 1.042 | ΣSAR<1.6, Not required |

2.4 GHz WLAN Main + BT (Laptop Mode)

| No | . Conditions | Position | Max. WLAN Main | ВТ | SAR Sum | SPLSR |
|----|---------------------------|-------------|----------------------|-------|---------|---------------------------|
| 7 | 2.4 GHz WLAN Main + BT | Bottom side | 0.289 | 0.082 | 0.371 | ΣSAR<1.6, Not required |

5 GHz WLAN Main + BT (Laptop Mode)

| No. | Conditions | Position | Max. WLAN Main | ВТ | SAR Sum | SPLSR |
|-----|-------------------------|-------------|----------------------|-------|---------|---------------------------|
| 8 | 5 GHz WLAN Main + BT | Bottom side | 0.570 | 0.082 | 0.652 | ΣSAR<1.6, Not required |

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Hong-Bo Antenna:

2.4 GHz WLAN MIMO (Laptop Mode)

| No. | Conditions | Position | Max. WLAN Main | Max. WLAN Aux | SAR Sum | SPLSR |
|-----|---------------------------------|-------------|----------------------|------------------|---------|---------------------------|
| 9 | 2.4 GHz WLAN Main + WLAN Aux | Bottom side | 0.460 | 0.463 | 0.923 | ΣSAR<1.6, Not required |

5 GHz WLAN MIMO (Laptop Mode)

| No. | Conditions | Position | Max. WLAN Main | Max. WLAN Aux | SAR Sum | SPLSR |
|-----|-------------------------------|-------------|----------------------|------------------|---------|---------------------------|
| 10 | 5 GHz WLAN Main + WLAN Aux | Bottom side | 0.879 | 0.654 | 1.533 | ΣSAR<1.6, Not required |

2.4 GHz WLAN Main + BT (Laptop Mode)

| ١ | No. | Conditions | Position | Max. WLAN Main | ВТ | SAR Sum | SPLSR |
|---|-----|---------------------------|-------------|----------------------|-------|---------|---------------------------|
| | 11 | 2.4 GHz WLAN Main + BT | Bottom side | 0.460 | 0.082 | 0.542 | ΣSAR<1.6, Not required |

5 GHz WLAN Main + BT (Laptop Mode)

| No. | Conditions | Position | Max. WLAN Main | ВТ | SAR Sum | SPLSR |
|-----|-------------------------|-------------|----------------------|-------|---------|---------------------------|
| 12 | 5 GHz WLAN Main + BT | Bottom side | 0.879 | 0.082 | 0.961 | ΣSAR<1.6, Not required |

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4. Instruments List

| | LIST | | | | |
|--------------|--------------------------|--------------------|------------------|--------------------------|--------------------------|
| Manufacturer | Device | Туре | Serial number | Date of last calibration | Date of next calibration |
| SPEAG | Dosimetric E-Field | EX3DV4 | 7466 | Jul.04,2017 | Jul.03,2018 |
| OI EAG | Probe | EXOD V 4 | 3938 | Sep.28,2017 | Sep.27,2018 |
| | | D2450V2 | 727 | Apr.21,2017 | Apr.20,2018 |
| | System Validation | D2400V2 | 121 | Apr.24,2018 | Apr.23,2019 |
| GFLAG | Dipole | D5GHzV2 | 1023 | Jan.20,2017 | Jan.19,2018 |
| | | D30112V2 | 1023 | Jan.25,2018 | Jan.24,2019 |
| SPEAG | Data acquisition | DAE4 | 547 | Mar.22,2017 | Mar.21,2018 |
| SFLAG | Electronics | DALT | 1260 | Sep.28,2017 | Sep.27,2018 |
| SPEAG | Software | DASY 52 V52.8.8 | N/A | Calibration not required | Calibration not required |
| SPEAG | Phantom | ELI | N/A | Calibration not required | Calibration not required |
| Agilent | Network | E5071C | MY46107530 | Jan.20,2017 | Jan.19,2018 |
| . ig.io.iii | Analyzer | | | Feb.26,2018 | |
| Agilent | Dielectric Probe Kit | 85070E | MY44300677 | Calibration not required | Calibration not required |
| | | 772D | MY52180142 | Apr.13,2017 | Apr.12,2018 |
| Agilent | Agilent Dual-directional | | MY46151242 | Jul.11,2017 | Jul.10,2018 |
| , (g.1011t | coupler | 778D | MY52180302 | Apr.13,2017 | Apr.12,2018 |
| | | | MY48220468 | Aug.28,2017 | Aug.27,2018 |

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| Manufacturer | Device | Туре | Serial number | Date of last calibration | Date of next calibration |
|--------------|----------------|------------|------------------|--------------------------|--------------------------|
| Agilent | RF Signal | N5181A | MY50144143 | 1 | Feb.28,2018 |
| Genera | Generator | NOTOTA | | | Mar.13,2019 |
| Agilent | Power Meter | E4417A | MY51410006 | Jan.20,2017 | Jan.19,2018 |
| Agnorit | 1 ower weter | | MY52240003 | Feb.01,2018 | Jan.31,2019 |
| | | MY51470001 | Jan.20,2017 | Jan.19,2018 | |
| Agilent | Power Sensor | E9301H | MY52200003 | Dec.21,2017 | Dec.20,2018 |
| Agiloni | 1 OWEI OCIISOI | 2330111 | MY51470002 | Jan.20,2017 | Jan.19,2018 |
| | | | MY52200004 | Dec.21,2017 | Dec.20,2018 |
| TECPEL | Digital | DTM-303A | TP130077 | Mar.17,2017 | Mar.16,2018 |
| | thermometer | D I W-SOSA | TP130075 | Mar.09,2018 | Mar.08,2019 |

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5. Measurements

Date: 2017/10/24

WLAN 802.11b_Body_Bottom side_CH 11_0mm_Main

Communication System: WLAN(2.4G); Frequency: 2462 MHz; Duty Cycle: 1:1

Medium parameters used: f = 2462 MHz; $\sigma = 2.003 \text{ S/m}$; $\varepsilon_r = 52.389$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Ambient temperature: 22.5°C; Liquid temperature: 22.4°C

DASY5 Configuration:

Probe: EX3DV4 - SN7466; ConvF(7.94, 7.94, 7.94); Calibrated: 2017/7/5;

Sensor-Surface: 2mm (Mechanical Surface Detection)

Electronics: DAE4 Sn547; Calibrated: 2017/3/22

Phantom: Body

• DASY52 52.8.8(1258); SEMCAD X 14.6.10(7373)

Configuration/Body/Area Scan (61x101x1): Interpolated grid: dx=12 mm, dy=12 mm Maximum value of SAR (interpolated) = 0.379 W/kg

Configuration/Body/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm,

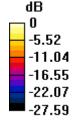
dy=5mm, dz=5mm

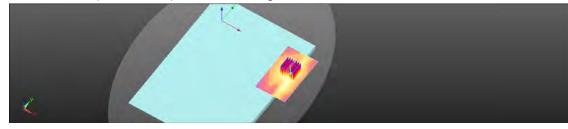
Reference Value = 0.03200 V/m; Power Drift = 0.08 dB

Peak SAR (extrapolated) = 0.524 W/kg

SAR(1 g) = 0.243 W/kg; SAR(10 g) = 0.113 W/kg

Maximum value of SAR (measured) = 0.378 W/kg





0 dB = 0.378 W/kg = -4.23 dBW/kg

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Date: 2017/10/24

WLAN 802.11g_Body_Bottom side_CH 6_0mm_Main

Communication System: WLAN(2.4G); Frequency: 2437 MHz; Duty Cycle: 1:1

Medium parameters used: f = 2437 MHz; $\sigma = 1.971$ S/m; $\epsilon_r = 52.478$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Ambient temperature: 22.5°C; Liquid temperature: 22.4°C

DASY5 Configuration:

- Probe: EX3DV4 SN7466; ConvF(7.94, 7.94, 7.94); Calibrated: 2017/7/5;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn547; Calibrated: 2017/3/22
- Phantom: Body
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7373)

Configuration/Body/Area Scan (61x101x1): Interpolated grid: dx=12 mm, dy=12 mm Maximum value of SAR (interpolated) = 0.460 W/kg

Configuration/Body/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm,

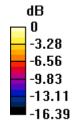
dy=5mm, dz=5mm

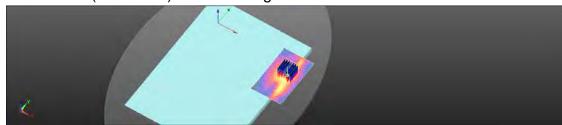
Reference Value = 1.278 V/m; Power Drift = -0.13 dB

Peak SAR (extrapolated) = 0.684 W/kg

SAR(1 g) = 0.321 W/kg; SAR(10 g) = 0.150 W/kg

Maximum value of SAR (measured) = 0.482 W/kg





0 dB = 0.482 W/kg = -3.17 dBW/kg

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Date: 2017/10/27

WLAN 802.11a 5.2G_Body_Bottom side_CH 40_0mm_Main

Communication System: WLAN(5G); Frequency: 5200 MHz; Duty Cycle: 1:1

Medium parameters used: f = 5200 MHz; $\sigma = 5.153 \text{ S/m}$; $\varepsilon_r = 49.726$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Ambient temperature: 22.3°C; Liquid temperature: 22.5°C

DASY5 Configuration:

- Probe: EX3DV4 SN7466; ConvF(5.2, 5.2, 5.2); Calibrated: 2017/7/5;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn547; Calibrated: 2017/3/22
- Phantom: Body
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7373)

Configuration/Body/Area Scan (71x111x1): Interpolated grid: dx=10 mm, dy=10 mm Maximum value of SAR (interpolated) = 0.641 W/kg

Configuration/Body/Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm,

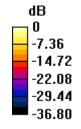
dy=4mm, dz=2mm

Reference Value = 0.5980 V/m; Power Drift = -0.16 dB

Peak SAR (extrapolated) = 1.43 W/kg

SAR(1 g) = 0.353 W/kg; SAR(10 g) = 0.125 W/kg

Maximum value of SAR (measured) = 0.689 W/kg





0 dB = 0.689 W/kg = -1.62 dBW/kg

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Date: 2017/11/4

WLAN 802.11a 5.3G_Body_Bottom side_CH 52_0mm_Main

Communication System: WLAN(5G); Frequency: 5260 MHz; Duty Cycle: 1:1

Medium parameters used: f = 5260 MHz; $\sigma = 5.336 \text{ S/m}$; $\varepsilon_r = 50.039$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Ambient temperature: 22.2°C; Liquid temperature: 22.1°C

DASY5 Configuration:

- Probe: EX3DV4 SN7466; ConvF(5.1, 5.1, 5.1); Calibrated: 2017/7/5;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn547; Calibrated: 2017/3/22
- Phantom: Body
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7373)

Configuration/Body/Area Scan (71x101x1): Interpolated grid: dx=10 mm, dy=10 mm Maximum value of SAR (interpolated) = 0.723 W/kg

Configuration/Body/Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm,

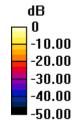
dy=4mm, dz=2mm

Reference Value = 42.64 V/m; Power Drift = 0.07 dB

Peak SAR (extrapolated) = 1.51 W/kg

SAR(1 g) = 0.365 W/kg; SAR(10 g) = 0.129 W/kg

Maximum value of SAR (measured) = 0.714 W/kg





0 dB = 0.714 W/kg = -1.46 dBW/kg

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Date: 2017/11/5

WLAN 802.11a 5.6G_Body_Bottom side_CH 116_0mm_Main

Communication System: WLAN(5G); Frequency: 5580 MHz; Duty Cycle: 1:1

Medium parameters used: f = 5580 MHz; $\sigma = 5.706 \text{ S/m}$; $\epsilon_r = 47.689$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Ambient temperature: 22.3°C; Liquid temperature: 22.3°C

DASY5 Configuration:

- Probe: EX3DV4 SN7466; ConvF(4.27, 4.27, 4.27); Calibrated: 2017/7/5;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn547; Calibrated: 2017/3/22
- Phantom: Body
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7373)

Configuration/Body/Area Scan (71x101x1): Interpolated grid: dx=10 mm, dy=10 mm Maximum value of SAR (interpolated) = 1.08 W/kg

Configuration/Body/Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm,

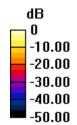
dy=4mm, dz=2mm

Reference Value = 33.78 V/m; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 2.13 W/kg

SAR(1 g) = 0.495 W/kg; SAR(10 g) = 0.153 W/kg

Maximum value of SAR (measured) = 1.04 W/kg





0 dB = 1.04 W/kg = 0.18 dBW/kg

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Date: 2017/11/5

WLAN 802.11a 5.8G_Body_Bottom side_CH 157_0mm_Main

Communication System: WLAN(5G); Frequency: 5785 MHz; Duty Cycle: 1:1

Medium parameters used: f = 5785 MHz; $\sigma = 6.08 \text{ S/m}$; $\varepsilon_r = 46.989$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Ambient temperature: 22.1°C; Liquid temperature: 21.8°C

DASY5 Configuration:

- Probe: EX3DV4 SN7466; ConvF(4.48, 4.48, 4.48); Calibrated: 2017/7/5;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn547; Calibrated: 2017/3/22
- Phantom: Body
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7373)

Configuration/Body/Area Scan (71x101x1): Interpolated grid: dx=10 mm, dy=10 mm Maximum value of SAR (interpolated) = 1.30 W/kg

Configuration/Body/Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm,

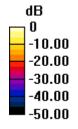
dy=4mm, dz=2mm

Reference Value = 2.772 V/m; Power Drift = 0.09 dB

Peak SAR (extrapolated) = 2.80 W/kg

SAR(1 g) = 0.637 W/kg; SAR(10 g) = 0.211 W/kg

Maximum value of SAR (measured) = 1.30 W/kg





0 dB = 1.30 W/kg = 1.15 dBW/kg

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Date: 2017/10/24

WLAN 802.11b Body Bottom side CH 1 0mm Aux

Communication System: WLAN(2.45G); Frequency: 2412 MHz; Duty Cycle: 1:1 Medium parameters used: f = 2412 MHz; $\sigma = 1.938 \text{ S/m}$; $\varepsilon_r = 52.536$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Ambient temperature: 22.5°C; Liquid temperature: 22.4°C

DASY5 Configuration:

- Probe: EX3DV4 SN7466; ConvF(7.94, 7.94, 7.94); Calibrated: 2017/7/5;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn547; Calibrated: 2017/3/22
- Phantom: Body
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7373)

Configuration/Body/Area Scan (61x91x1): Interpolated grid: dx=12 mm, dy=12 mm Maximum value of SAR (interpolated) = 0.514 W/kg

Configuration/Body/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm,

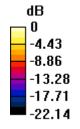
dy=5mm, dz=5mm

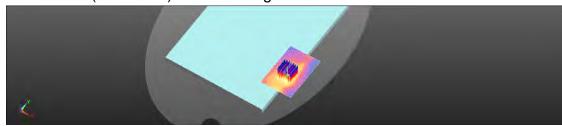
Reference Value = 0.3910 V/m; Power Drift = 0.06 dB

Peak SAR (extrapolated) = 0.756 W/kg

SAR(1 g) = 0.345 W/kg; SAR(10 g) = 0.155 W/kg

Maximum value of SAR (measured) = 0.543 W/kg





0 dB = 0.543 W/kg = -2.65 dBW/kg

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Date: 2017/10/24

WLAN 802.11g_Body_Bottom side_CH 6_0mm_Aux

Communication System: WLAN(2.4G); Frequency: 2437 MHz; Duty Cycle: 1:1

Medium parameters used: f = 2437 MHz; $\sigma = 1.971$ S/m; $\varepsilon_r = 52.478$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Ambient temperature: 22.5°C; Liquid temperature: 22.4°C

DASY5 Configuration:

- Probe: EX3DV4 SN7466; ConvF(7.94, 7.94, 7.94); Calibrated: 2017/7/5;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn547; Calibrated: 2017/3/22
- Phantom: Body
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7373)

Configuration/Body/Area Scan (61x91x1): Interpolated grid: dx=12 mm, dy=12 mm Maximum value of SAR (interpolated) = 0.609 W/kg

Configuration/Body/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm,

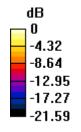
dy=5mm, dz=5mm

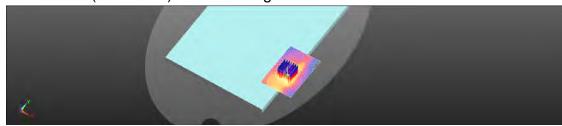
Reference Value = 0.5020 V/m; Power Drift = 0.06 dB

Peak SAR (extrapolated) = 0.914 W/kg

SAR(1 g) = 0.415 W/kg; SAR(10 g) = 0.185 W/kg

Maximum value of SAR (measured) = 0.650 W/kg





0 dB = 0.650 W/kg = -1.87 dBW/kg

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Date: 2017/10/27

WLAN 802.11a 5.2G_Body_Bottom side_CH 40_0mm_Aux

Communication System: WLAN(5G); Frequency: 5200 MHz; Duty Cycle: 1:1

Medium parameters used: f = 5260 MHz; $\sigma = 5.153 \text{ S/m}$; $\varepsilon_r = 49.726$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Ambient temperature: 22.3°C; Liquid temperature: 22.5°C

DASY5 Configuration:

- Probe: EX3DV4 SN7466; ConvF(5.1, 5.1, 5.1); Calibrated: 2017/7/5;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn547; Calibrated: 2017/3/22
- Phantom: Body
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7373)

Configuration/Body/Area Scan (71x101x1): Interpolated grid: dx=10 mm, dy=10 mm Maximum value of SAR (interpolated) = 1.17 W/kg

Configuration/Body/Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm,

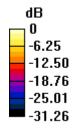
dy=4mm, dz=2mm

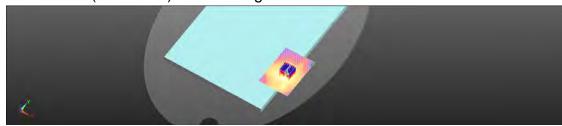
Reference Value = 23.16 V/m; Power Drift = 0.00 dB

Peak SAR (extrapolated) = 2.42 W/kg

SAR(1 g) = 0.602 W/kg; SAR(10 g) = 0.220 W/kg

Maximum value of SAR (measured) = 1.17 W/kg





0 dB = 1.17 W/kg = 0.67 dBW/kg

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Date: 2017/11/4

WLAN 802.11a 5.3G_Body_Bottom side_CH 52_0mm_Aux

Communication System: WLAN(5G); Frequency: 5260 MHz; Duty Cycle: 1:1

Medium parameters used: f = 5260 MHz; $\sigma = 5.336 \text{ S/m}$; $\varepsilon_r = 50.039$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Ambient temperature: 22.2°C; Liquid temperature: 22.1°C

DASY5 Configuration:

- Probe: EX3DV4 SN7466; ConvF(5.1, 5.1, 5.1); Calibrated: 2017/7/5;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn547; Calibrated: 2017/3/22
- Phantom: Body
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7373)

Configuration/Body/Area Scan (71x101x1): Interpolated grid: dx=10 mm, dy=10 mm Maximum value of SAR (interpolated) = 0.937 W/kg

Configuration/Body/Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm,

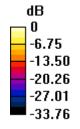
dy=4mm, dz=2mm

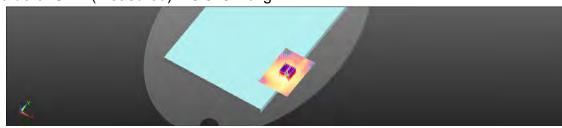
Reference Value = 37.91 V/m; Power Drift = 0.10 dB

Peak SAR (extrapolated) = 1.97 W/kg

SAR(1 g) = 0.488 W/kg; SAR(10 g) = 0.173 W/kg

Maximum value of SAR (measured) = 0.929 W/kg





0 dB = 0.929 W/kg = -0.32 dBW/kg

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Date: 2017/11/5

WLAN 802.11a 5.6G_Body_Bottom side_CH 104_0mm_Aux

Communication System: WLAN(5G); Frequency: 5520 MHz; Duty Cycle: 1:1

Medium parameters used: f = 5520 MHz; $\sigma = 5.636 \text{ S/m}$; $\varepsilon_r = 47.772$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Ambient temperature: 22.3°C; Liquid temperature: 22.3°C

DASY5 Configuration:

- Probe: EX3DV4 SN7466; ConvF(4.27, 4.27, 4.27); Calibrated: 2017/7/5;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn547; Calibrated: 2017/3/22
- Phantom: Body
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7373)

Configuration/Body/Area Scan (71x101x1): Interpolated grid: dx=10 mm, dy=10 mm Maximum value of SAR (interpolated) = 1.33 W/kg

Configuration/Body/Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm,

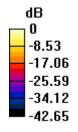
dy=4mm, dz=2mm

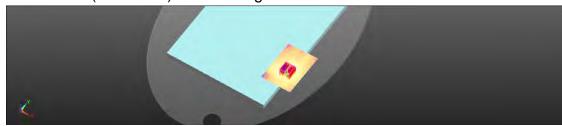
Reference Value = 1.683 V/m; Power Drift = 0.06 dB

Peak SAR (extrapolated) = 2.68 W/kg

SAR(1 g) = 0.707 W/kg; SAR(10 g) = 0.262 W/kg

Maximum value of SAR (measured) = 1.32 W/kg





0 dB = 1.32 W/kg = 1.21 dBW/kg

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Date: 2017/11/5

WLAN 802.11a 5.8G_Body_Bottom side_CH 149_0mm_Aux

Communication System: WLAN(5G); Frequency: 5745 MHz; Duty Cycle: 1:1

Medium parameters used: f = 5745 MHz; $\sigma = 6.033$ S/m; $\varepsilon_r = 47.041$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Ambient temperature: 22.1°C; Liquid temperature: 21.8°C

DASY5 Configuration:

- Probe: EX3DV4 SN7466; ConvF(4.48, 4.48, 4.48); Calibrated: 2017/7/5;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn547; Calibrated: 2017/3/22
- Phantom: Body
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7373)

Configuration/Body/Area Scan (71x101x1): Interpolated grid: dx=10 mm, dy=10 mm Maximum value of SAR (interpolated) = 1.08 W/kg

Configuration/Body/Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm,

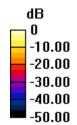
dy=4mm, dz=2mm

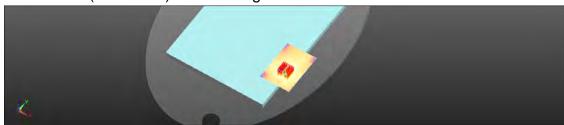
Reference Value = 54.92 V/m; Power Drift = 0.08 dB

Peak SAR (extrapolated) = 2.16 W/kg

SAR(1 g) = 0.534 W/kg; SAR(10 g) = 0.193 W/kg

Maximum value of SAR (measured) = 1.04 W/kg





0 dB = 1.04 W/kg = 0.18 dBW/kg

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Date: 2017/10/24

WLAN 802.11b_Body_Bottom side_CH 11_0mm_Main

Communication System: WLAN(2.4G); Frequency: 2462 MHz; Duty Cycle: 1:1

Medium parameters used: f = 2462 MHz; $\sigma = 2.003 \text{ S/m}$; $\varepsilon_r = 52.389$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Ambient temperature: 22.5°C; Liquid temperature: 22.4°C

DASY5 Configuration:

- Probe: EX3DV4 SN7466; ConvF(7.94, 7.94, 7.94); Calibrated: 2017/7/5;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn547; Calibrated: 2017/3/22
- Phantom: Body
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7373)

Configuration/Body/Area Scan (61x101x1): Interpolated grid: dx=12 mm, dy=12 mm Maximum value of SAR (interpolated) = 0.384 W/kg

Configuration/Body/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm,

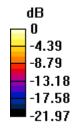
dy=5mm, dz=5mm

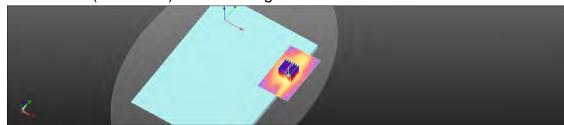
Reference Value = 0.7390 V/m; Power Drift = -0.13 dB

Peak SAR (extrapolated) = 0.508 W/kg

SAR(1 g) = 0.236 W/kg; SAR(10 g) = 0.108 W/kg

Maximum value of SAR (measured) = 0.369 W/kg





0 dB = 0.369 W/kg = -4.33 dBW/kg

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Date: 2017/10/24

WLAN 802.11g_Body_Bottom side_CH 6_0mm_Main

Communication System: WLAN(2.4G); Frequency: 2437 MHz; Duty Cycle: 1:1

Medium parameters used: f = 2437 MHz; $\sigma = 1.971$ S/m; $\epsilon_r = 52.478$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Ambient temperature: 22.5°C; Liquid temperature: 22.4°C

DASY5 Configuration:

- Probe: EX3DV4 SN7466; ConvF(7.94, 7.94, 7.94); Calibrated: 2017/7/5;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn547; Calibrated: 2017/3/22
- Phantom: Body
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7373)

Configuration/Body/Area Scan (61x101x1): Interpolated grid: dx=12 mm, dy=12 mm Maximum value of SAR (interpolated) = 0.409 W/kg

Configuration/Body/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm,

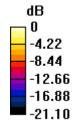
dy=5mm, dz=5mm

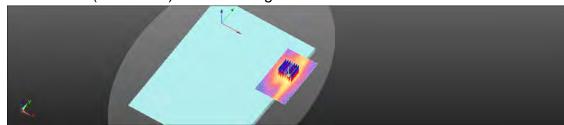
Reference Value = 0.3370 V/m; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 0.604 W/kg

SAR(1 g) = 0.282 W/kg; SAR(10 g) = 0.129 W/kg

Maximum value of SAR (measured) = 0.441 W/kg





0 dB = 0.441 W/kg = -3.55 dBW/kg

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Date: 2017/10/27

WLAN 802.11a 5.2G_Body_Bottom side_CH 40_0mm_Main

Communication System: WLAN(5G); Frequency: 5200 MHz; Duty Cycle: 1:1

Medium parameters used: f = 5200 MHz; $\sigma = 5.153 \text{ S/m}$; $\varepsilon_r = 49.726$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Ambient temperature: 22.3°C; Liquid temperature: 22.5°C

DASY5 Configuration:

- Probe: EX3DV4 SN7466; ConvF(5.2, 5.2, 5.2); Calibrated: 2017/7/5;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn547; Calibrated: 2017/3/22
- Phantom: Body
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7373)

Configuration/Body/Area Scan (71x111x1): Interpolated grid: dx=10 mm, dy=10 mm Maximum value of SAR (interpolated) = 0.833 W/kg

Configuration/Body/Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm,

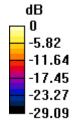
dy=4mm, dz=2mm

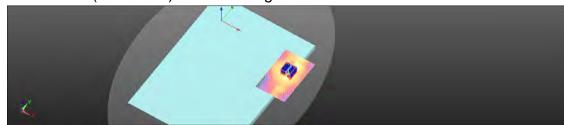
Reference Value = 0.2480 V/m; Power Drift = 0.03 dB

Peak SAR (extrapolated) = 1.89 W/kg

SAR(1 g) = 0.449 W/kg; SAR(10 g) = 0.151 W/kg

Maximum value of SAR (measured) = 0.868 W/kg





0 dB = 0.868 W/kg = -0.61 dBW/kg

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Date: 2017/11/4

WLAN 802.11a 5.3G_Body_Bottom side_CH 52_0mm_Main

Communication System: WLAN(5G); Frequency: 5260 MHz; Duty Cycle: 1:1

Medium parameters used: f = 5260 MHz; $\sigma = 5.336 \text{ S/m}$; $\epsilon_r = 50.039$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Ambient temperature: 22.2°C; Liquid temperature: 22.1°C

DASY5 Configuration:

- Probe: EX3DV4 SN7466; ConvF(5.1, 5.1, 5.1); Calibrated: 2017/7/5;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn547; Calibrated: 2017/3/22
- Phantom: Body
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7373)

Configuration/Body/Area Scan (71x101x1): Interpolated grid: dx=10 mm, dy=10 mm Maximum value of SAR (interpolated) = 0.904 W/kg

Configuration/Body/Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm,

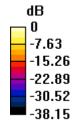
dy=4mm, dz=2mm

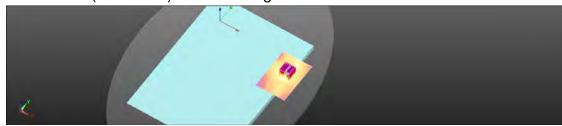
Reference Value = 42.64 V/m; Power Drift = 0.10 dB

Peak SAR (extrapolated) = 1.95 W/kg

SAR(1 g) = 0.465 W/kg; SAR(10 g) = 0.158 W/kg

Maximum value of SAR (measured) = 0.894 W/kg





0 dB = 0.894 W/kg = -0.49 dBW/kg

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Date: 2017/11/5

WLAN 802.11a 5.6G_Body_Bottom side_CH 116_0mm_Main

Communication System: WLAN(5G); Frequency: 5580 MHz; Duty Cycle: 1:1

Medium parameters used: f = 5580 MHz; $\sigma = 5.706 \text{ S/m}$; $\epsilon_r = 47.689$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Ambient temperature: 22.3°C; Liquid temperature: 22.3°C

DASY5 Configuration:

- Probe: EX3DV4 SN7466; ConvF(4.27, 4.27, 4.27); Calibrated: 2017/7/5;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn547; Calibrated: 2017/3/22
- Phantom: Body
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7373)

Configuration/Body/Area Scan (71x101x1): Interpolated grid: dx=10 mm, dy=10 mm Maximum value of SAR (interpolated) = 1.13 W/kg

Configuration/Body/Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm,

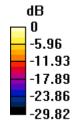
dy=4mm, dz=2mm

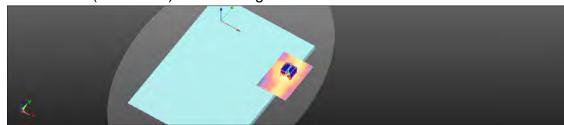
Reference Value = 77.69 V/m; Power Drift = 0.07 dB

Peak SAR (extrapolated) = 2.54 W/kg

SAR(1 g) = 0.560 W/kg; SAR(10 g) = 0.179 W/kg

Maximum value of SAR (measured) = 1.11 W/kg





0 dB = 1.11 W/kg = 0.44 dBW/kg

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Date: 2017/11/5

WLAN 802.11a 5.8G_Body_Bottom side_CH 157_0mm_Main

Communication System: WLAN(5G); Frequency: 5785 MHz; Duty Cycle: 1:1

Medium parameters used: f = 5785 MHz; $\sigma = 6.08 \text{ S/m}$; $\varepsilon_r = 46.989$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Ambient temperature: 22.1°C; Liquid temperature: 21.8°C

DASY5 Configuration:

- Probe: EX3DV4 SN7466; ConvF(4.48, 4.48, 4.48); Calibrated: 2017/7/5;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn547; Calibrated: 2017/3/22
- Phantom: Body
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7373)

Configuration/Body/Area Scan (71x101x1): Interpolated grid: dx=10 mm, dy=10 mm Maximum value of SAR (interpolated) = 1.09 W/kg

Configuration/Body/Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm,

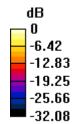
dy=4mm, dz=2mm

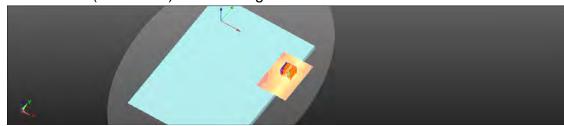
Reference Value = 2.569 V/m; Power Drift = -0.09 dB

Peak SAR (extrapolated) = 2.46 W/kg

SAR(1 g) = 0.567 W/kg; SAR(10 g) = 0.217 W/kg

Maximum value of SAR (measured) = 1.09 W/kg





0 dB = 1.09 W/kg = 0.37 dBW/kg

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Date: 2017/10/24

WLAN 802.11b Body Bottom side CH 1 0mm Aux

Communication System: WLAN(2.4G); Frequency: 2412 MHz; Duty Cycle: 1:1

Medium parameters used: f = 2412 MHz; $\sigma = 1.938 \text{ S/m}$; $\varepsilon_r = 52.536$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Ambient temperature: 22.5°C; Liquid temperature: 22.4°C

DASY5 Configuration:

- Probe: EX3DV4 SN7466; ConvF(7.94, 7.94, 7.94); Calibrated: 2017/7/5;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn547; Calibrated: 2017/3/22
- Phantom: Body
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7373)

Configuration/Body/Area Scan (61x91x1): Interpolated grid: dx=12 mm, dy=12 mm Maximum value of SAR (interpolated) = 0.155 W/kg

Configuration/Body/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm,

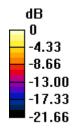
dy=5mm, dz=5mm

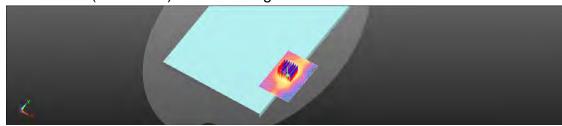
Reference Value = 22.79 V/m; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 0.228 W/kg

SAR(1 g) = 0.104 W/kg; SAR(10 g) = 0.049 W/kg

Maximum value of SAR (measured) = 0.165 W/kg





0 dB = 0.165 W/kg = -7.84 dBW/kg

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Date: 2017/10/24

WLAN 802.11g_Body_Bottom side_CH 6_0mm_Aux

Communication System: WLAN(2.4G); Frequency: 2437 MHz; Duty Cycle: 1:1

Medium parameters used: f = 2437 MHz; $\sigma = 1.971$ S/m; $\varepsilon_r = 52.478$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Ambient temperature: 22.5°C; Liquid temperature: 22.4°C

DASY5 Configuration:

- Probe: EX3DV4 SN7466; ConvF(7.94, 7.94, 7.94); Calibrated: 2017/7/5;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn547; Calibrated: 2017/3/22
- Phantom: Body
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7373)

Configuration/Body/Area Scan (61x91x1): Interpolated grid: dx=12 mm, dy=12 mm Maximum value of SAR (interpolated) = 0.611 W/kg

Configuration/Body/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm,

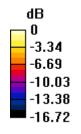
dy=5mm, dz=5mm

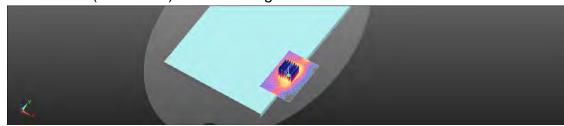
Reference Value = 1.697 V/m; Power Drift = 0.19 dB

Peak SAR (extrapolated) = 0.885 W/kg

SAR(1 g) = 0.411 W/kg; SAR(10 g) = 0.196 W/kg

Maximum value of SAR (measured) = 0.646 W/kg





0 dB = 0.646 W/kg = -1.90 dBW/kg

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Date: 2017/10/27

WLAN 802.11a 5.2G_Body_Bottom side_CH 40_0mm_Aux

Communication System: WLAN(5G); Frequency: 5200 MHz; Duty Cycle: 1:1

Medium parameters used: f = 5200 MHz; $\sigma = 5.153 \text{ S/m}$; $\varepsilon_r = 49.726$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Ambient temperature: 22.3°C; Liquid temperature: 22.5°C

DASY5 Configuration:

- Probe: EX3DV4 SN7466; ConvF(5.1, 5.1, 5.1); Calibrated: 2017/7/5;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn547; Calibrated: 2017/3/22
- Phantom: Body
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7373)

Configuration/Body/Area Scan (71x101x1): Interpolated grid: dx=10 mm, dy=10 mm Maximum value of SAR (interpolated) = 0.808 W/kg

Configuration/Body/Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm,

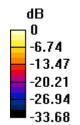
dy=4mm, dz=2mm

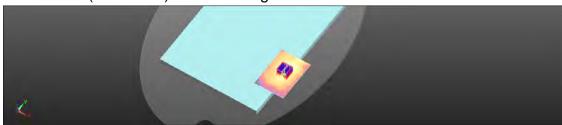
Reference Value = 41.93 V/m; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 1.75 W/kg

SAR(1 g) = 0.417 W/kg; SAR(10 g) = 0.143 W/kg

Maximum value of SAR (measured) = 0.792 W/kg





0 dB = 0.792 W/kg = -1.01 dBW/kg

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Date: 2017/11/4

WLAN 802.11a 5.3G_Body_Bottom side_CH 52_0mm_Aux

Communication System: WLAN(5G); Frequency: 5260 MHz; Duty Cycle: 1:1

Medium parameters used: f = 5260 MHz; $\sigma = 5.336 \text{ S/m}$; $\varepsilon_r = 50.039$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Ambient temperature: 22.2°C; Liquid temperature: 22.1°C

DASY5 Configuration:

- Probe: EX3DV4 SN7466; ConvF(5.1, 5.1, 5.1); Calibrated: 2017/7/5;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn547; Calibrated: 2017/3/22
- Phantom: Body
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7373)

Configuration/Body/Area Scan (71x101x1): Interpolated grid: dx=10 mm, dy=10 mm Maximum value of SAR (interpolated) = 0.844 W/kg

Configuration/Body/Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm,

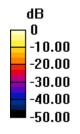
dy=4mm, dz=2mm

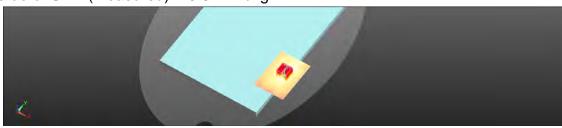
Reference Value = 21.38 V/m; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 1.91 W/kg

SAR(1 g) = 0.436 W/kg; SAR(10 g) = 0.148 W/kg

Maximum value of SAR (measured) = 0.872 W/kg





0 dB = 0.872 W/kg = -0.59 dBW/kg

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Date: 2017/11/5

WLAN 802.11a 5.6G_Body_Bottom side_CH 104_0mm_Aux

Communication System: WLAN(5G); Frequency: 5520 MHz; Duty Cycle: 1:1

Medium parameters used: f = 5520 MHz; $\sigma = 5.636 \text{ S/m}$; $\varepsilon_r = 47.772$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Ambient temperature: 22.3°C; Liquid temperature: 22.3°C

DASY5 Configuration:

- Probe: EX3DV4 SN7466; ConvF(4.27, 4.27, 4.27); Calibrated: 2017/7/5;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn547; Calibrated: 2017/3/22
- Phantom: Body
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7373)

Configuration/Body/Area Scan (71x101x1): Interpolated grid: dx=10 mm, dy=10 mm Maximum value of SAR (interpolated) = 0.876 W/kg

Configuration/Body/Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm,

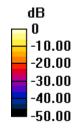
dy=4mm, dz=2mm

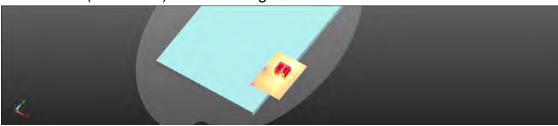
Reference Value = 0.4260 V/m; Power Drift = 0.11 dB

Peak SAR (extrapolated) = 1.90 W/kg

SAR(1 g) = 0.449 W/kg; SAR(10 g) = 0.153 W/kg

Maximum value of SAR (measured) = 0.876 W/kg





0 dB = 0.876 W/kg = -0.57 dBW/kg

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Date: 2017/11/5

WLAN 802.11a 5.8G_Body_Bottom side_CH 149_0mm_Aux

Communication System: WLAN(5G); Frequency: 5745 MHz; Duty Cycle: 1:1

Medium parameters used: f = 5745 MHz; $\sigma = 6.033 \text{ S/m}$; $\varepsilon_r = 47.041$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Ambient temperature: 22.1°C; Liquid temperature: 21.8°C

DASY5 Configuration:

- Probe: EX3DV4 SN7466; ConvF(4.48, 4.48, 4.48); Calibrated: 2017/7/5;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn547; Calibrated: 2017/3/22
- Phantom: Body
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7373)

Configuration/Body/Area Scan (71x101x1): Interpolated grid: dx=10 mm, dy=10 mm Maximum value of SAR (interpolated) = 0.958 W/kg

Configuration/Body/Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm,

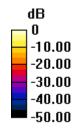
dy=4mm, dz=2mm

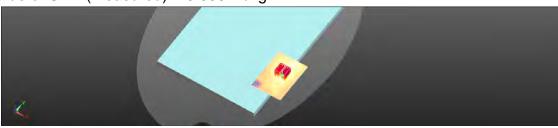
Reference Value = 0.2210 V/m; Power Drift = 0.16 dB

Peak SAR (extrapolated) = 2.04 W/kg

SAR(1 g) = 0.469 W/kg; SAR(10 g) = 0.168 W/kg

Maximum value of SAR (measured) = 0.930 W/kg





0 dB = 0.930 W/kg = -0.32 dBW/kg

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Date: 2018/6/11

WLAN 802.11b_Body_Bottom side_CH 6_Main

Communication System: WLAN 2.45G; Frequency: 2437 MHz; Duty Cycle: 1:1

Medium parameters used: f = 2437 MHz; $\sigma = 1.951$ S/m; $\varepsilon_r = 53.609$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Ambient temperature: 21.7°C; Liquid temperature: 22.1°C

DASY5 Configuration:

- Probe: EX3DV4 SN3938; ConvF(7.42, 7.42, 7.42); Calibrated: 2017/9/29;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1260; Calibrated: 2017/9/28
- Phantom: Body
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7373)

Configuration/Body/Area Scan (61x151x1): Interpolated grid: dx=12 mm, dy=12 mm Maximum value of SAR (interpolated) = 1.17 W/kg

Configuration/Body/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm,

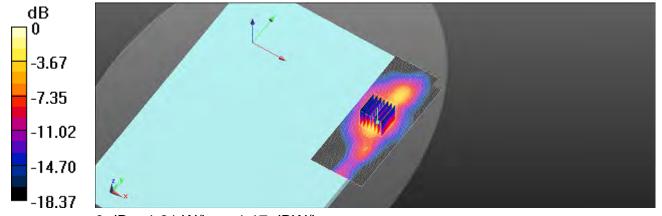
dy=5mm, dz=5mm

Reference Value = 2.786 V/m; Power Drift = -0.19 dB

Peak SAR (extrapolated) = 1.76 W/kg

SAR(1 g) = 0.837 W/kg; SAR(10 g) = 0.385 W/kg

Maximum value of SAR (measured) = 1.31 W/kg



0 dB = 1.31 W/kg = 1.17 dBW/kg

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Date: 2018/6/11

WLAN 802.11g_Body_Bottom side_CH 6_Main

Communication System: WLAN 2.45G; Frequency: 2437 MHz; Duty Cycle: 1:1

Medium parameters used: f = 2437 MHz; $\sigma = 1.951$ S/m; $\varepsilon_r = 53.609$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Ambient temperature: 21.7°C; Liquid temperature: 22.1°C

DASY5 Configuration:

- Probe: EX3DV4 SN3938; ConvF(7.42, 7.42, 7.42); Calibrated: 2017/9/29;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1260; Calibrated: 2017/9/28
- Phantom: Body
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7373)

Configuration/Body/Area Scan (61x151x1): Interpolated grid: dx=12 mm, dy=12 mm Maximum value of SAR (interpolated) = 1.60 W/kg

Configuration/Body/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm,

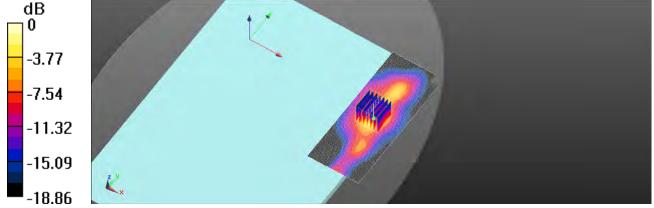
dy=5mm, dz=5mm

Reference Value = 4.183 V/m; Power Drift = 0.18 dB

Peak SAR (extrapolated) = 2.38 W/kg

SAR(1 g) = 1.12 W/kg; SAR(10 g) = 0.513 W/kg

Maximum value of SAR (measured) = 1.75 W/kg



0 dB = 1.75 W/kg = 2.43 dBW/kg

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Date: 2018/6/12

WLAN 802.11a 5.2G_Body_Bottom side_CH 40_Main

Communication System: WLAN 5G; Frequency: 5200 MHz; Duty Cycle: 1:1

Medium parameters used: f = 5200 MHz; $\sigma = 5.138 \text{ S/m}$; $\epsilon_r = 49.339$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Ambient temperature: 22.2°C; Liquid temperature: 21.8°C

DASY5 Configuration:

- Probe: EX3DV4 SN3938; ConvF(4.41, 4.41, 4.41); Calibrated: 2017/9/29;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1260; Calibrated: 2017/9/28
- Phantom: Body
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7373)

Configuration/Body/Area Scan (71x181x1): Interpolated grid: dx=10 mm, dy=10 mm Maximum value of SAR (interpolated) = 1.11 W/kg

Configuration/Body/Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm,

dy=4mm, dz=2mm

Reference Value = 3.341 V/m; Power Drift = -0.12 dB

Peak SAR (extrapolated) = 2.20 W/kg

SAR(1 g) = 0.559 W/kg; SAR(10 g) = 0.199 W/kg

Maximum value of SAR (measured) = 1.05 W/kg

Configuration/Body/Zoom Scan (7x7x12)/Cube 1: Measurement grid: dx=4mm,

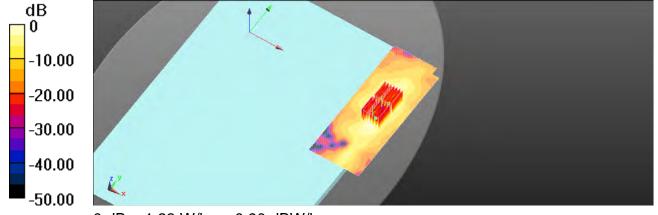
dy=4mm, dz=2mm

Reference Value = 3.341 V/m; Power Drift = -0.12 dB

Peak SAR (extrapolated) = 2.95 W/kg

SAR(1 g) = 0.616 W/kg; SAR(10 g) = 0.195 W/kg

Maximum value of SAR (measured) = 1.23 W/kg



0 dB = 1.23 W/kg = 0.90 dBW/kg

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Date: 2018/6/13

WLAN 802.11a 5.3G_Body_Bottom side_CH 52_Main

Communication System: WLAN 5G; Frequency: 5260 MHz; Duty Cycle: 1:1

Medium parameters used: f = 5260 MHz; $\sigma = 5.248 \text{ S/m}$; $\varepsilon_r = 49.11$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Ambient temperature: 21.5°C; Liquid temperature: 21.9°C

DASY5 Configuration:

- Probe: EX3DV4 SN3938; ConvF(4.41, 4.41, 4.41); Calibrated: 2017/9/29;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1260; Calibrated: 2017/9/28
- Phantom: Body
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7373)

Configuration/Body/Area Scan (71x181x1): Interpolated grid: dx=10 mm, dy=10 mm Maximum value of SAR (interpolated) = 1.14 W/kg

Configuration/Body/Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm,

dy=4mm, dz=2mm

Reference Value = 3.251 V/m; Power Drift = 0.19 dB

Peak SAR (extrapolated) = 3.46 W/kg

SAR(1 g) = 0.685 W/kg; SAR(10 g) = 0.192 W/kg

Maximum value of SAR (measured) = 1.51 W/kg

Configuration/Body/Zoom Scan (7x7x12)/Cube 1: Measurement grid: dx=4mm,

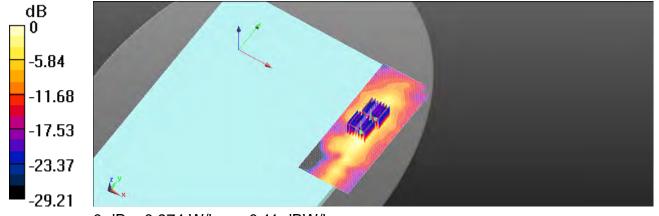
dy=4mm, dz=2mm

Reference Value = 3.251 V/m; Power Drift = 0.19 dB

Peak SAR (extrapolated) = 2.08 W/kg

SAR(1 g) = 0.518 W/kg; SAR(10 g) = 0.189 W/kg

Maximum value of SAR (measured) = 0.974 W/kg



0 dB = 0.974 W/kg = -0.11 dBW/kg

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Date: 2018/6/14

WLAN 802.11a 5.6G_Body_Bottom side_CH 116_Main

Communication System: WLAN 5G; Frequency: 5580 MHz; Duty Cycle: 1:1

Medium parameters used: f = 5580 MHz; $\sigma = 5.776 \text{ S/m}$; $\epsilon_r = 48.093$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Ambient temperature: 22.0°C; Liquid temperature: 21.5°C

DASY5 Configuration:

- Probe: EX3DV4 SN3938; ConvF(3.9, 3.9, 3.9); Calibrated: 2017/9/29;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1260; Calibrated: 2017/9/28
- Phantom: Body
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7373)

Configuration/Body/Area Scan (71x181x1): Interpolated grid: dx=10 mm, dy=10 mm Maximum value of SAR (interpolated) = 0.736 W/kg

Configuration/Body/Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm,

dy=4mm, dz=2mm

Reference Value = 2.311 V/m; Power Drift = 0.18 dB

Peak SAR (extrapolated) = 3.07 W/kg

SAR(1 g) = 0.446 W/kg; SAR(10 g) = 0.121 W/kg

Maximum value of SAR (measured) = 0.920 W/kg

Configuration/Body/Zoom Scan (7x7x12)/Cube 1: Measurement grid: dx=4mm,

dy=4mm, dz=2mm

Reference Value = 2.311 V/m; Power Drift = 0.18 dB

Peak SAR (extrapolated) = 2.35 W/kg

SAR(1 g) = 0.418 W/kg; SAR(10 g) = 0.107 W/kg Maximum value of SAR (measured) = 0.944 W/kg

-6.40 -12.80 -19.20 -25.60 -32.00

0 dB = 0.944 W/kg = -0.25 dBW/kg

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Date: 2018/6/15

WLAN 802.11a 5.8G_Body_Bottom side_CH 157_Main

Communication System: WLAN 5G; Frequency: 5785 MHz; Duty Cycle: 1:1

Medium parameters used: f = 5785 MHz; $\sigma = 6.104 \text{ S/m}$; $\varepsilon_r = 47.424$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Ambient temperature: 22.3°C; Liquid temperature: 21.9°C

DASY5 Configuration:

- Probe: EX3DV4 SN3938; ConvF(4.09, 4.09, 4.09); Calibrated: 2017/9/29;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1260; Calibrated: 2017/9/28
- Phantom: Body
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7373)

Configuration/Body/Area Scan (71x181x1): Interpolated grid: dx=10 mm, dy=10 mm Maximum value of SAR (interpolated) = 0.769 W/kg

Configuration/Body/Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm,

dy=4mm, dz=2mm

Reference Value = 2.542 V/m; Power Drift = 0.19 dB

Peak SAR (extrapolated) = 2.31 W/kg

SAR(1 g) = 0.398 W/kg; SAR(10 g) = 0.115 W/kg

Maximum value of SAR (measured) = 0.855 W/kg

Configuration/Body/Zoom Scan (7x7x12)/Cube 1: Measurement grid: dx=4mm,

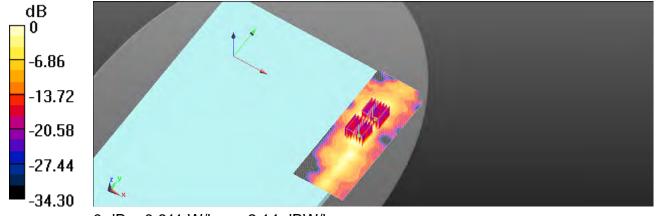
dv=4mm. dz=2mm

Reference Value = 2.542 V/m; Power Drift = 0.19 dB

Peak SAR (extrapolated) = 2.32 W/kg

SAR(1 g) = 0.290 W/kg; SAR(10 g) = 0.077 W/kg

Maximum value of SAR (measured) = 0.611 W/kg



0 dB = 0.611 W/kg = -2.14 dBW/kg

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Date: 2018/6/11

WLAN 802.11b_Body_Bottom side_CH 1_Aux

Communication System: WLAN 2.45G; Frequency: 2412 MHz; Duty Cycle: 1:1 Medium parameters used: f = 2412 MHz; $\sigma = 1.92$ S/m; $\varepsilon_r = 53.706$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Ambient temperature: 21.7°C; Liquid temperature: 22.1°C

DASY5 Configuration:

- Probe: EX3DV4 SN3938; ConvF(7.42, 7.42, 7.42); Calibrated: 2017/9/29;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1260; Calibrated: 2017/9/28
- Phantom: Body
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7373)

Configuration/Body/Area Scan (51x151x1): Interpolated grid: dx=12 mm, dy=12 mm Maximum value of SAR (interpolated) = 0.644 W/kg

Configuration/Body/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm,

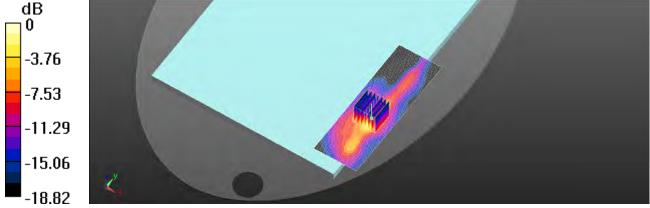
dv=5mm, dz=5mm

Reference Value = 3.491 V/m; Power Drift = -0.15 dB

Peak SAR (extrapolated) = 0.959 W/kg

SAR(1 g) = 0.452 W/kg; SAR(10 g) = 0.200 W/kg

Maximum value of SAR (measured) = 0.701 W/kg



0 dB = 0.701 W/kg = -1.54 dBW/kg

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Date: 2018/6/11

WLAN 802.11g_Body_Bottom side_CH 6_Aux

Communication System: WLAN 2.45G; Frequency: 2437 MHz; Duty Cycle: 1:1

Medium parameters used: f = 2437 MHz; $\sigma = 1.951$ S/m; $\varepsilon_r = 53.609$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Ambient temperature: 21.7°C; Liquid temperature: 22.1°C

DASY5 Configuration:

- Probe: EX3DV4 SN3938; ConvF(7.42, 7.42, 7.42); Calibrated: 2017/9/29;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1260; Calibrated: 2017/9/28
- Phantom: Body
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7373)

Configuration/Body/Area Scan (51x151x1): Interpolated grid: dx=12 mm, dy=12 mm Maximum value of SAR (interpolated) = 0.957 W/kg

Configuration/Body/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm,

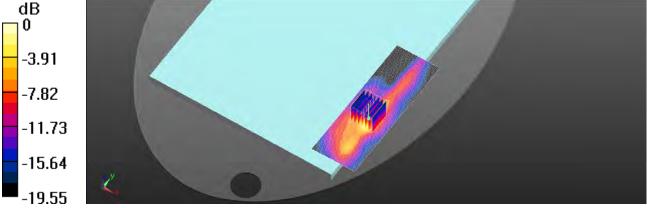
dy=5mm, dz=5mm

Reference Value = 3.267 V/m; Power Drift = -0.17 dB

Peak SAR (extrapolated) = 1.49 W/kg

SAR(1 g) = 0.693 W/kg; SAR(10 g) = 0.306 W/kg

Maximum value of SAR (measured) = 1.10 W/kg



0 dB = 1.10 W/kg = 0.41 dBW/kg

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Date: 2018/6/12

WLAN 802.11a 5.2G_Body_Bottom side_CH 40_Aux

Communication System: WLAN 5G; Frequency: 5200 MHz; Duty Cycle: 1:1

Medium parameters used: f = 5200 MHz; $\sigma = 5.138 \text{ S/m}$; $\epsilon_r = 49.339$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Ambient temperature: 22.2°C; Liquid temperature: 21.8°C

DASY5 Configuration:

- Probe: EX3DV4 SN3938; ConvF(4.41, 4.41, 4.41); Calibrated: 2017/9/29;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1260; Calibrated: 2017/9/28
- Phantom: Body
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7373)

Configuration/Body/Area Scan (71x181x1): Interpolated grid: dx=10 mm, dy=10 mm Maximum value of SAR (interpolated) = 1.56 W/kg

Configuration/Body/Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm,

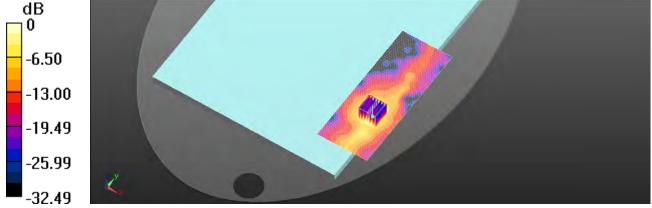
dy=4mm, dz=2mm

Reference Value = 2.791 V/m; Power Drift = 0.18 dB

Peak SAR (extrapolated) = 3.57 W/kg

SAR(1 g) = 0.781 W/kg; SAR(10 g) = 0.244 W/kg

Maximum value of SAR (measured) = 1.58 W/kg



0 dB = 1.58 W/kg = 1.99 dBW/kg

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Date: 2018/6/13

WLAN 802.11a 5.3G_Body_Bottom side_CH 52_Aux

Communication System: WLAN 5G; Frequency: 5260 MHz; Duty Cycle: 1:1

Medium parameters used: f = 5260 MHz; $\sigma = 5.248 \text{ S/m}$; $\varepsilon_r = 49.11$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Ambient temperature: 21.5°C; Liquid temperature: 21.9°C

DASY5 Configuration:

- Probe: EX3DV4 SN3938; ConvF(4.41, 4.41, 4.41); Calibrated: 2017/9/29;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1260; Calibrated: 2017/9/28
- Phantom: Body
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7373)

Configuration/Body/Area Scan (71x181x1): Interpolated grid: dx=10 mm, dy=10 mm Maximum value of SAR (interpolated) = 0.933 W/kg

Configuration/Body/Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm,

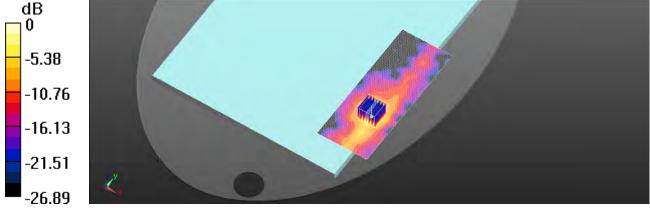
dy=4mm, dz=2mm

Reference Value = 2.379 V/m; Power Drift = 0.14 dB

Peak SAR (extrapolated) = 2.16 W/kg

SAR(1 g) = 0.457 W/kg; SAR(10 g) = 0.144 W/kg

Maximum value of SAR (measured) = 0.959 W/kg



0 dB = 0.959 W/kg = -0.18 dBW/kg

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Date: 2018/6/14

WLAN 802.11a 5.6G_Body_Bottom side_CH 104_Aux

Communication System: WLAN 5G; Frequency: 5520 MHz; Duty Cycle: 1:1

Medium parameters used: f = 5520 MHz; $\sigma = 5.661 \text{ S/m}$; $\epsilon_r = 48.305$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Ambient temperature: 22.0°C; Liquid temperature: 21.5°C

DASY5 Configuration:

- Probe: EX3DV4 SN3938; ConvF(3.9, 3.9, 3.9); Calibrated: 2017/9/29;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1260; Calibrated: 2017/9/28
- Phantom: Body
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7373)

Configuration/Body/Area Scan (71x181x1): Interpolated grid: dx=10 mm, dy=10 mm Maximum value of SAR (interpolated) = 0.991 W/kg

Configuration/Body/Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm,

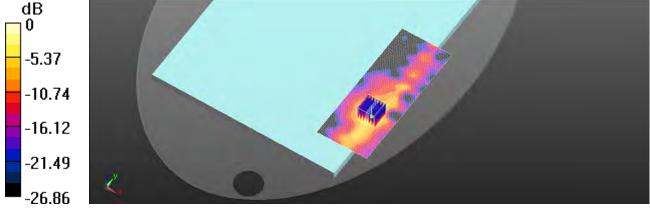
dy=4mm, dz=2mm

Reference Value = 4.831 V/m; Power Drift = -0.17 dB

Peak SAR (extrapolated) = 2.22 W/kg

SAR(1 g) = 0.465 W/kg; SAR(10 g) = 0.147 W/kg

Maximum value of SAR (measured) = 0.934 W/kg



0 dB = 0.934 W/kg = -0.30 dBW/kg

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Date: 2018/6/15

WLAN 802.11a 5.8G_Body_Bottom side_CH 165_Aux

Communication System: WLAN 5G; Frequency: 5825 MHz; Duty Cycle: 1:1

Medium parameters used: f = 5825 MHz; $\sigma = 6.165 \text{ S/m}$; $\varepsilon_r = 47.391$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Ambient temperature: 22.3°C; Liquid temperature: 21.9°C

DASY5 Configuration:

- Probe: EX3DV4 SN3938; ConvF(4.09, 4.09, 4.09); Calibrated: 2017/9/29;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1260; Calibrated: 2017/9/28
- Phantom: Body
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7373)

Configuration/Body/Area Scan (71x181x1): Interpolated grid: dx=10 mm, dy=10

Maximum value of SAR (interpolated) = 0.538 W/kg

Configuration/Body/Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm,

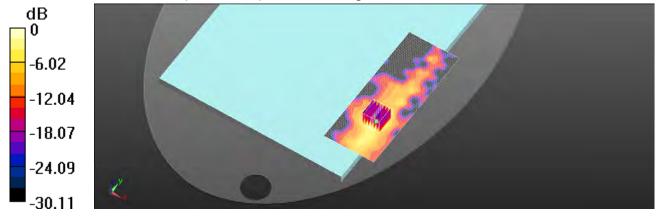
dy=4mm, dz=2mm

Reference Value = 4.254 V/m; Power Drift = -0.13 dB

Peak SAR (extrapolated) = 1.08 W/kg

SAR(1 g) = 0.251 W/kg; SAR(10 g) = 0.082 W/kg

Maximum value of SAR (measured) = 0.543 W/kg



0 dB = 0.543 W/kg = -2.65 dBW/kg

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6. SAR System Performance Verification

Date: 2017/10/24

Dipole 2450 MHz SN:727

Communication System: CW; Frequency: 2450 MHz; Duty Cycle: 1:1

Medium parameters used: f = 2450 MHz; $\sigma = 1.985 \text{ S/m}$; $\epsilon_r = 52.461$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Ambient temperature: 22.5°C; Liquid temperature: 22.4°C

DASY5 Configuration:

Probe: EX3DV4 - SN7466; ConvF(7.94, 7.94, 7.94); Calibrated: 2017/7/5;

Sensor-Surface: 2mm (Mechanical Surface Detection)

Electronics: DAE4 Sn547; Calibrated: 2017/3/22

Phantom: Body

DASY52 52.8.8(1258); SEMCAD X 14.6.10(7373)

Configuration/Pin=250mW/Area Scan (61x131x1): Interpolated grid: dx=12 mm,

dy=12 mm

Maximum value of SAR (interpolated) = 20.7 W/kg

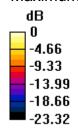
Configuration/Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid:

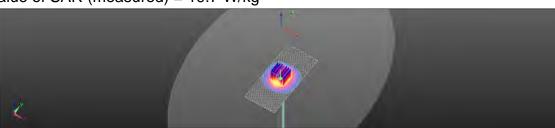
dx=5mm, dy=5mm, dz=5mm

Reference Value = 98.80 V/m; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 27.2 W/kg

SAR(1 g) = 12.8 W/kg; SAR(10 g) = 5.93 W/kg Maximum value of SAR (measured) = 19.7 W/kg





0 dB = 19.7 W/kq = 12.95 dBW/kq

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Date: 2018/6/11

Dipole 2450 MHz SN:727

Communication System: CW; Frequency: 2450 MHz; Duty Cycle: 1:1

Medium parameters used: f = 2450 MHz; $\sigma = 1.967 \text{ S/m}$; $\varepsilon_r = 53.582$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Ambient temperature: 21.7°C; Liquid temperature: 22.1°C

DASY5 Configuration:

Probe: EX3DV4 - SN3938; ConvF(7.42, 7.42, 7.42); Calibrated: 2017/9/29;

Sensor-Surface: 2mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1260; Calibrated: 2017/9/28

Phantom: Body

DASY52 52.8.8(1258); SEMCAD X 14.6.10(7373)

Configuration/Pin=250mW/Area Scan (51x51x1): Interpolated grid: dx=12 mm, dv=12 mm

Maximum value of SAR (interpolated) = 22.2 W/kg

Configuration/Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid:

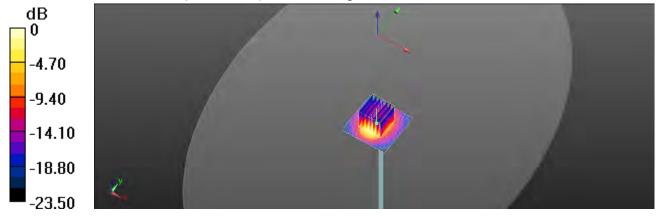
dx=5mm, dy=5mm, dz=5mm

Reference Value = 103.7 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 28.8 W/kg

SAR(1 g) = 13.3 W/kg; SAR(10 g) = 6 W/kg

Maximum value of SAR (measured) = 20.8 W/kg



0 dB = 20.8 W/kg = 13.18 dBW/kg

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Date: 2017/10/27

Dipole 5200 MHz SN:1023

Communication System: CW; Frequency: 5200 MHz; Duty Cycle: 1:1

Medium parameters used: f = 5200 MHz; $\sigma = 5.153 \text{ S/m}$; $\varepsilon_r = 49.726$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Ambient temperature: 22.3°C; Liquid temperature: 22.5°C

DASY5 Configuration:

Probe: EX3DV4 - SN7466; ConvF(5.2, 5.2, 5.2); Calibrated: 2017/7/5;

Sensor-Surface: 2mm (Mechanical Surface Detection)

• Electronics: DAE4 Sn547; Calibrated: 2017/3/22

Phantom: Body

DASY52 52.8.8(1258); SEMCAD X 14.6.10(7373)

Configuration/Pin=100mW/Area Scan (61x91x1): Interpolated grid: dx=10 mm, dy=10 mm

Maximum value of SAR (interpolated) = 16.3 W/kg

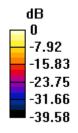
Configuration/Pin=100mW/Zoom Scan (7x7x12)/Cube 0: Measurement grid:

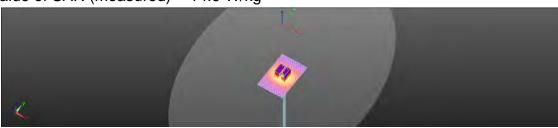
dx=4mm, dy=4mm, dz=2mm

Reference Value = 57.10 V/m; Power Drift = -0.05 dB

Peak SAR (extrapolated) = 29.3 W/kg

SAR(1 g) = 7.22 W/kg; SAR(10 g) = 2.07 W/kg Maximum value of SAR (measured) = 14.9 W/kg





0 dB = 14.9 W/kg = 11.73 dBW/kg

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Date: 2018/6/12

Dipole 5200 MHz SN:1023

Communication System: CW; Frequency: 5200 MHz; Duty Cycle: 1:1

Medium parameters used: f = 5200 MHz; $\sigma = 5.138 \text{ S/m}$; $\varepsilon_r = 49.339$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Ambient temperature: 22.2°C; Liquid temperature: 21.8°C

DASY5 Configuration:

Probe: EX3DV4 - SN3938; ConvF(4.41, 4.41, 4.41); Calibrated: 2017/9/29;

Sensor-Surface: 2mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1260; Calibrated: 2017/9/28

Phantom: Body

DASY52 52.8.8(1258); SEMCAD X 14.6.10(7373)

Configuration/Pin=100mW/Area Scan (51x51x1): Interpolated grid: dx=10 mm, dv=10 mm

Maximum value of SAR (interpolated) = 15.6 W/kg

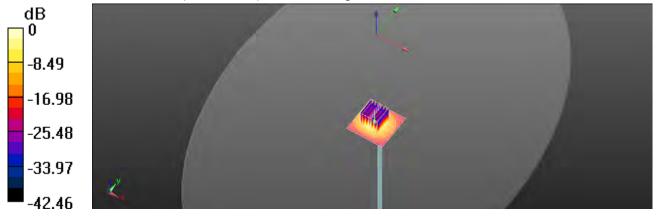
Configuration/Pin=100mW/Zoom Scan (7x7x12)/Cube 0: Measurement grid:

dx=4mm, dy=4mm, dz=2mm

Reference Value = 55.71 V/m; Power Drift = 0.16 dB

Peak SAR (extrapolated) = 34.6 W/kg

SAR(1 g) = 7.44 W/kg; SAR(10 g) = 2.06 W/kgMaximum value of SAR (measured) = 16.1 W/kg



0 dB = 16.1 W/kg = 12.07 dBW/kg

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Date: 2017/11/4

Dipole 5300 MHz_SN:1023

Communication System: CW; Frequency: 5300 MHz; Duty Cycle: 1:1

Medium parameters used: f = 5300 MHz; $\sigma = 5.38 \text{ S/m}$; $\varepsilon_r = 49.974$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Ambient temperature: 22.2°C; Liquid temperature: 22.1°C

DASY5 Configuration:

Probe: EX3DV4 - SN7466; ConvF(5.1, 5.1, 5.1); Calibrated: 2017/7/5;

Sensor-Surface: 2mm (Mechanical Surface Detection)

Electronics: DAE4 Sn547; Calibrated: 2017/3/22

Phantom: Body

DASY52 52.8.8(1258); SEMCAD X 14.6.10(7373)

Configuration/Pin=100mW/Area Scan (61x81x1): Interpolated grid: dx=10 mm, dv=10 mm

Maximum value of SAR (interpolated) = 15.9 W/kg

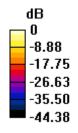
Configuration/Pin=100mW/Zoom Scan (7x7x12)/Cube 0: Measurement grid:

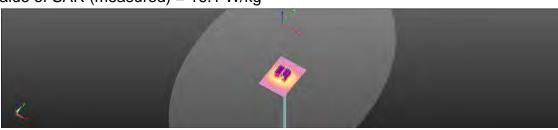
dx=4mm, dy=4mm, dz=2mm

Reference Value = 58.21 V/m; Power Drift = -0.08 dB

Peak SAR (extrapolated) = 31.3 W/kg

SAR(1 g) = 7.55 W/kg; SAR(10 g) = 2.12 W/kg Maximum value of SAR (measured) = 16.1 W/kg





0 dB = 16.1 W/kg = 12.07 dBW/kg

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Date: 2018/6/13

Dipole 5300 MHz SN:1023

Communication System: CW; Frequency: 5300 MHz; Duty Cycle: 1:1

Medium parameters used: f = 5300 MHz; $\sigma = 5.307 \text{ S/m}$; $\varepsilon_r = 49.032$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Ambient temperature: 21.5°C; Liquid temperature: 21.9°C

DASY5 Configuration:

Probe: EX3DV4 - SN3938; ConvF(4.41, 4.41, 4.41); Calibrated: 2017/9/29;

Sensor-Surface: 2mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1260; Calibrated: 2017/9/28

Phantom: Body

DASY52 52.8.8(1258); SEMCAD X 14.6.10(7373)

Configuration/Pin=100mW/Area Scan (51x51x1): Interpolated grid: dx=10 mm, dv=10 mm

Maximum value of SAR (interpolated) = 15.9 W/kg

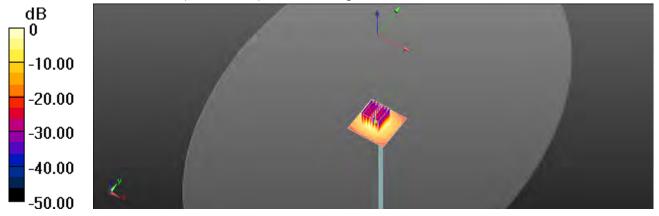
Configuration/Pin=100mW/Zoom Scan (7x7x12)/Cube 0: Measurement grid:

dx=4mm, dy=4mm, dz=2mm

Reference Value = 54.94 V/m; Power Drift = 0.15 dB

Peak SAR (extrapolated) = 35.5 W/kg

SAR(1 g) = 7.48 W/kg; SAR(10 g) = 2.05 W/kgMaximum value of SAR (measured) = 16.1 W/kg



0 dB = 16.1 W/kg = 12.07 dBW/kg

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Date: 2017/11/5

Dipole 5600 MHz_SN:1023

Communication System: CW; Frequency: 5600 MHz; Duty Cycle: 1:1

Medium parameters used: f = 5600 MHz; $\sigma = 5.73 \text{ S/m}$; $\varepsilon_r = 47.658$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Ambient temperature: 22.3°C; Liquid temperature: 22.3°C

DASY5 Configuration:

Probe: EX3DV4 - SN7466; ConvF(4.27, 4.27, 4.27); Calibrated: 2017/7/5;

Sensor-Surface: 2mm (Mechanical Surface Detection)

Electronics: DAE4 Sn547; Calibrated: 2017/3/22

Phantom: Body

DASY52 52.8.8(1258); SEMCAD X 14.6.10(7373)

Configuration/Pin=100mW/Area Scan (61x81x1): Interpolated grid: dx=10 mm,

dy=10 mm

Maximum value of SAR (interpolated) = 18.3 W/kg

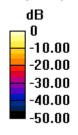
Configuration/Pin=100mW/Zoom Scan (7x7x12)/Cube 0: Measurement grid:

dx=4mm, dy=4mm, dz=2mm

Reference Value = 61.06 V/m; Power Drift = 0.06 dB

Peak SAR (extrapolated) = 37.0 W/kg

SAR(1 g) = 8.31 W/kg; SAR(10 g) = 2.33 W/kg Maximum value of SAR (measured) = 18.3 W/kg





0 dB = 18.3 W/kg = 12.62 dBW/kg

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Date: 2018/6/14

Dipole 5600 MHz_SN:1023

Communication System: CW; Frequency: 5600 MHz; Duty Cycle: 1:1

Medium parameters used: f = 5600 MHz; $\sigma = 5.798 \text{ S/m}$; $\varepsilon_r = 48.043$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Ambient temperature: 22.0°C; Liquid temperature: 21.5°C

DASY5 Configuration:

Probe: EX3DV4 - SN3938; ConvF(3.9, 3.9, 3.9); Calibrated: 2017/9/29;

Sensor-Surface: 2mm (Mechanical Surface Detection)

• Electronics: DAE4 Sn1260; Calibrated: 2017/9/28

Phantom: Body

DASY52 52.8.8(1258); SEMCAD X 14.6.10(7373)

Configuration/Pin=100mW/Area Scan (51x51x1): Interpolated grid: dx=10 mm, dv=10 mm

Maximum value of SAR (interpolated) = 17.7 W/kg

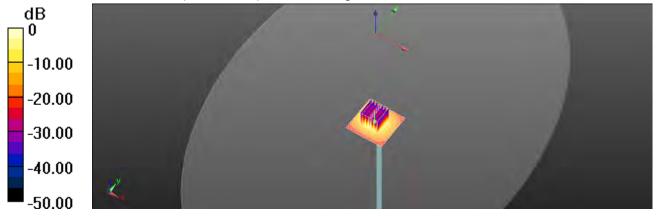
Configuration/Pin=100mW/Zoom Scan (7x7x12)/Cube 0: Measurement grid:

dx=4mm, dy=4mm, dz=2mm

Reference Value = 57.16 V/m; Power Drift = 0.10 dB

Peak SAR (extrapolated) = 40.8 W/kg

SAR(1 g) = 8.15 W/kg; SAR(10 g) = 2.21 W/kg Maximum value of SAR (measured) = 17.7 W/kg



0 dB = 17.7 W/kg = 12.48 dBW/kg

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No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路 134 號



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Date: 2017/11/10

Dipole 5800 MHz_SN:1023

Communication System: CW; Frequency: 5800 MHz; Duty Cycle: 1:1

Medium parameters used: f = 5800 MHz; $\sigma = 6.097 \text{ S/m}$; $\varepsilon_r = 46.974$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Ambient temperature: 22.1°C; Liquid temperature: 21.8°C

DASY5 Configuration:

- Probe: EX3DV4 SN7466; ConvF(4.48, 4.48, 4.48); Calibrated: 2017/7/5;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn547; Calibrated: 2017/3/22
- Phantom: Body
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7373)

Configuration/Pin=100mW/Area Scan (61x91x1): Interpolated grid: dx=10 mm, dy=10 mm

Maximum value of SAR (interpolated) = 18.0 W/kg

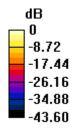
Configuration/Pin=100mW/Zoom Scan (7x7x12)/Cube 0: Measurement grid:

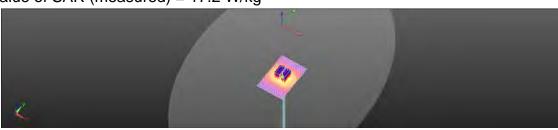
dx=4mm, dy=4mm, dz=2mm

Reference Value = 56.78 V/m; Power Drift = -0.03 dB

Peak SAR (extrapolated) = 38.2 W/kg

SAR(1 g) = 7.91 W/kg; SAR(10 g) = 2.21 W/kg Maximum value of SAR (measured) = 17.2 W/kg





0 dB = 17.2 W/kg = 12.37 dBW/kg

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Date: 2018/6/15

Dipole 5800 MHz SN:1023

Communication System: CW; Frequency: 5800 MHz; Duty Cycle: 1:1

Medium parameters used: f = 5800 MHz; $\sigma = 6.131 \text{ S/m}$; $\varepsilon_r = 47.395$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Ambient temperature: 22.3°C; Liquid temperature: 21.9°C

DASY5 Configuration:

Probe: EX3DV4 - SN3938; ConvF(4.09, 4.09, 4.09); Calibrated: 2017/9/29;

Sensor-Surface: 2mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1260; Calibrated: 2017/9/28

Phantom: Body

• DASY52 52.8.8(1258); SEMCAD X 14.6.10(7373)

Configuration/Pin=100mW/Area Scan (51x51x1): Interpolated grid: dx=10 mm, dy=10 mm

Maximum value of SAR (interpolated) = 16.6 W/kg

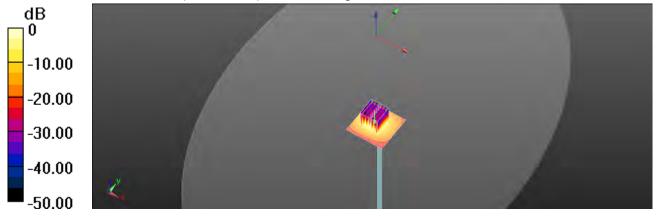
Configuration/Pin=100mW/Zoom Scan (7x7x12)/Cube 0: Measurement grid:

dx=4mm, dy=4mm, dz=2mm

Reference Value = 49.99 V/m; Power Drift = 0.25 dB

Peak SAR (extrapolated) = 38.6 W/kg

SAR(1 g) = 7.71 W/kg; SAR(10 g) = 2.11 W/kg Maximum value of SAR (measured) = 16.8 W/kg



0 dB = 16.8 W/kg = 12.25 dBW/kg

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7. DAE & Probe Calibration Certificate

Calibration Laboratory of Schmid & Partner Engineering AG Zeughausstrasse 43, 8004 Zurich, Switzerland





Schweizerischer Kallbrierdienst Service suisse d'étatonnage Servizio svizzero di taratura Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS) The Swiss Accreditation Service is one of the signatories to the EA

Multilateral Agreement for the recognition of calibration certificates

SGS - TW (Auden)

Accreditation No.: SCS 0108

Certificate No: DAE4-547_Mar17 CALIBRATION CERTIFICATE Object DAE4 - SD 000 D04 BM - SN: 547 Calibration procedure(s) **DA CAL-06 v29** Calibration procedure for the data acquisition electronics (DAE) Calibration date March 22, 2017 The measurements and the uncertainties with confidence probability are given on the following pages and are part of the confidence All calibrations have been conducted in the closed laboratory facility, environment temperature (22 ± 31°C and furnidity < 70%. Calibration Equipment used (M&TE critical for calibration) 10 # Cal Date (Certificate No.) Scheduled Calibration Primary Standards Keithley Multimeter Type 2001 SN: 0810278 09-Sep-16 (No:19065) Secondary Standards I ID N Check Date (in house) Scheduled Check SE UWS 053 AA 1001 05-Jan-17 (in house check) In house check: Jan-18 Auto DAE Calibration Unit SE UMS 006 AA 1002 05-Jan-17 (in house check) In house check: Jan-18 Calibrator Box V2 I Signatu Eric Hainfeld Deputy Technical Manager Fin Bombatt Approved by: Issuind: March 22, 2017 This celebration certificate shall not be improduced ascept in full without written approval of the laboratory

Certificate No: DAE4-547 Mar17

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Calibration Laboratory of Schmid & Partner Engineering AG Zeughausstrasse 43, 8004 Zurich, Switzerland





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Accented by the Swiss Accenditation Service (SAS)

The Swiss Accenditation Service is one of the eignateries to the EA

Mullitateral Agreement for the recognition of calibration certificates

Accreditation No.: SCS 0108

Glossary

DAE data acquisition electronics

Connector angle Information used in DASY system to align probe sensor X to the robot

coordinate system.

Methods Applied and Interpretation of Parameters

- DC Voltage Measurement: Calibration Factor assessed for use in DASY system by comparison with a calibrated instrument traceable to national standards. The figure given corresponds to the full scale range of the voltmeter in the respective range.
- Connector angle. The angle of the connector is assessed measuring the angle mechanically by a tool inserted. Uncertainty is not required.
- The following parameters as documented in the Appendix contain technical information as a
 result from the performance test and require no uncertainty.
 - DC Voltage Measurement Linearity: Verification of the Linearity at +10% and -10% of the nominal calibration voltage. Influence of offset voltage is included in this measurement.
 - Common mode sensitivity; Influence of a positive or negative common mode voltage on the differential measurement.
 - Channel separation: Influence of a voltage on the neighbor channels not subject to an
 input voltage.
 - AD Converter Values with inputs shorted, Values on the internal AD converter corresponding to zero input voltage
 - Input Offset Measurement: Output voltage and statistical results over a large number of zero voltage measurements.
 - Input Offset Current: Typical value for information; Maximum channel input offset current, not considering the input resistance.
 - Input resistance: Typical value for information: DAE input resistance at the connector, during internal auto-zeroing and during measurement.
 - Low Battery Alarm Voltage: Typical value for information. Below this voltage, a battery alarm signal is generated.
 - Power consumption: Typical value for information. Supply currents in various operating modes.

Certificate No: DAE4-547 Mar 17

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DC Voltage Measurement

A/D - Converter Resolution nominal

High Range: 1LSB = full range = -100...+300 mV Low Range: ILSB = BINV. full range = -1.....+3mV DASY measurement parameters. Auto Zero Time: 3 sec. Measuring time: 3 sec.

| Calibration Factors | X | Α. | Z |
|---------------------|-----------------------|-----------------------|-----------------------|
| High Range | 403.189 / 0.02% (k=2) | 403.093 ± 0.02% (k=2) | 402.739 ± 0.02% (k=2) |
| Low Range | 3,95348 ± 1.50% (k=2) | 3,90456 ± 1,50% (K=2) | 3,96243 ± 1.50% (k=2) |

Connector Angle

| Connector Angle to be used in DASY system | 91.0 °±1 |
|---|----------|

Cirtificate No: DAE4-647, Mart 7

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Appendix (Additional assessments outside the scope of SCS0108)

1. DC Voltage Linearity

| High Range | Reading (µV) | Difference (µV) | Error (%) |
|-------------------|--------------|-----------------|-----------|
| Channel X + Input | 200031.23 | 0,59 | 0.00 |
| Channel X + Input | 20005,44 | 2.04 | 0.01 |
| Channel X - Input | -20000.97 | 4,91 | -0.02 |
| Channel Y + Input | 200029.80 | -1.03 | -0.00 |
| Channel Y + Input | 20000.30 | -3.03 | -0.02 |
| Channel Y - Input | -20007.73 | -1.72 | 0.01 |
| Channel Z + Input | 200030,21 | -0.96 | -0.00 |
| Channel Z + Input | 20003.13 | -0.21 | -0.00 |
| Channel Z - Input | -20005.14 | 0.81 | -0.00 |

| Low Range | Reading (µV) | Difference (µV) | Error (%) |
|-------------------|--------------|-----------------|-----------|
| Channel X + Input | 2000.02 | -0.08 | -0.00 |
| Channel X + Input | 200 18 | 0.36 | 0.18 |
| Channel X - Input | -200.16 | 0.00 | -0.00 |
| Channel Y + Input | 2000,10 | 0.06 | 0.00 |
| Channel Y + Input | 199.43 | -0.40 | -0.20 |
| Channel Y - Input | -200.77 | -0.70 | 0.35 |
| Channel Z + Input | 2000,19 | 0.28 | 0.01 |
| Channel Z + Input | 198.82 | -1,00 | -0.50 |
| Channel Z - Input | -201.46 | -1,37 | 0.68 |

2. Common mode sensitivity

DASY measurement parameters. Auto Zero Time: 3 sec: Measuring time: 3 sec.

| | Common mode Input Voltage (mV) | High Range Average Reading (µV) | Low Range Average Reading (μV) |
|-----------|-----------------------------------|------------------------------------|-----------------------------------|
| Channel X | 200 | -2.09 | -5.00 |
| | - 200 | 6.80 | 4,50 |
| Channel V | 200 | -0.67 | 4.21 |
| | -200 | 0,37 | -0.41 |
| Channel Z | 200 | 5.07 | 4.93 |
| | - 200 | -7,67 | -8.12 |

3. Channel separation

| | Input Voltage (mV) | Channel X (µV) | Channel Y (µV) | Channel Z (µV) |
|-----------|--------------------|----------------|----------------|----------------|
| Channel X | 200 | - | 2.65 | -2.08 |
| Channel Y | 200 | 10,56 | | 3.60 |
| Channel Z | 200 | 4.55 | 7.85 | 100 |

Certificate No: DAE4-547_Mor17

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4. AD-Converter Values with inputs shorted

| | High Range (LSB) | Low Range (LSB) |
|-----------|------------------|-----------------|
| Channel X | 16364 | 15364 |
| Channel Y | 16476 | 16801 |
| Channel Z | 16077 | 16468 |

5. Input Offset Measurement

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

Inexal 10MD

| | Average (µV) | min. Offset (μV) | max. Offset (μV) | Std. Deviation (µV) |
|-----------|--------------|------------------|------------------|------------------------|
| Channel X | -0.53 | -1.14 | 0.26 | 0.31 |
| Channel Y | -1.03 | -2.43 | -0.21 | 0.32 |
| Channel Z | -1.56 | -2.31 | -0.62 | 0,35 |

6. Input Offset Current

Nominal Input circuitry offset current on all channels: <25fA

7. Input Resistance (Typical values for Information)

| | Zeroing (kOhm) | Measuring (MOhm) |
|-----------|----------------|------------------|
| Channel X | 200 | 200 |
| Channel Y | 200 | 200 |
| Channel Z | 200 | 200 |

8. Low Battery Alarm Voltage (Typical values for information)

| Typical values | Alarm Level (VDC) |
|----------------|-------------------|
| Supply (+ Vcc) | +7.9 |
| Supply (- Vcc) | -7,6 |

| Typical values | Switched off (mA) | Stand by (mA) | Transmitting (mA) |
|----------------|-------------------|---------------|-------------------|
| Supply (+ Vcc) | +0.01 | +6 | 914 |
| Supply (- Voc) | -0.01 | ~B | -9 |

Certificate No: DAE4-547_Mar1

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SGS-TW (Auden)

Accreditation No.: SCS 0108

Certificate No: DAE4-1260 Sep17 CALIBRATION CERTIFICATE DAE4 - SD 000 D04 BM - SN: 1260 Calibration procedure(s) QA CAL-06.v29 Calibration procedure for the data acquisition electronics (DAE) Calibration date: September 28, 2017 This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI). The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate. All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%, Calibration Equipment used (M&TE critical for calibration) Primary Standards ID# Cal Date (Certificate No.) Scheduled Calibration Keithley Multimeter Type 2001 SN: 0810278 31-Aug-17 (No:21092) Aug-18 Check Date (in house) Secondary Standards ID# Scheduled Check Auto DAE Calibration Unit SE UWS 053 AA 1001 05-Jan-17 (in house check) In house check: Jan-18 Calibrator Box V2.1 SE UMS 006 AA 1002 05-Jan-17 (in house check) In house check: Jan-18 Name Function Laboratory Technician Calibrated by: Dominique Steffen Approved by: Sven Kühn Deputy Manager Issued; September 28, 2017

Certificate No: DAE4-1260 Sep17

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Glossary

DAE data acquisition electronics

Connector angle information used in DASY system to align probe sensor X to the robot

coordinate system.

Methods Applied and Interpretation of Parameters

- DC Voltage Measurement: Calibration Factor assessed for use in DASY system by comparison with a calibrated instrument traceable to national standards. The figure given corresponds to the full scale range of the voltmeter in the respective range.
- Connector angle: The angle of the connector is assessed measuring the angle mechanically by a tool inserted. Uncertainty is not required.
- The following parameters as documented in the Appendix contain technical information as a
 result from the performance test and require no uncertainty.
 - DC Voltage Measurement Linearity: Verification of the Linearity at +10% and -10% of the nominal calibration voltage. Influence of offset voltage is included in this measurement.
 - Common mode sensitivity: Influence of a positive or negative common mode voltage on the differential measurement.
 - Channel separation: Influence of a voltage on the neighbor channels not subject to an input voltage.
 - AD Converter Values with inputs shorted: Values on the internal AD converter corresponding to zero input voltage
 - Input Offset Measurement. Output voltage and statistical results over a large number of zero voltage measurements.
 - Input Offset Current: Typical value for information; Maximum channel input offset current, not considering the input resistance.
 - Input resistance: Typical value for information: DAE input resistance at the connector, during internal auto-zeroing and during measurement.
 - Low Battery Alarm Voltage: Typical value for information. Below this voltage, a battery alarm signal is generated.
 - Power consumption: Typical value for information. Supply currents in various operating modes.

Certificate No: DAE4-1260 Sep 17

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DC Voltage Measurement

A/D - Converter Resolution nominal High Range: 1LSB = full range = -100...+300 mV full range = -1.....+3mV 6.1µV Low Range: 1LSB = BinV . DASY measurement parameters; Auto Zero Time: 3 sec; Measuring time: 3 sec

| Calibration Factors | X | Υ | Z |
|---------------------|-----------------------|-----------------------|-----------------------|
| High Range | 405.082 ± 0.02% (k=2) | 405.133 ± 0.02% (k=2) | 404.970 ± 0.02% (k=2) |
| Low Range | 3.98948 ± 1.50% (k=2) | 3.95701 ± 1.50% (k=2) | 3.98426 ± 1.50% (k=2) |

Connector Angle

| Connector Angle to be used in DASY system | 341.5 ° ± 1 " |
|---|---------------|

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Appendix (Additional assessments outside the scope of SCS0108)

1. DC Voltage Linearity

| High Range | Reading (µV) | Difference (µV) | Error (%) |
|-------------------|--------------|-----------------|-----------|
| Channel X + Input | 200030.04 | -3.23 | -0.00 |
| Channel X + Input | 20005.05 | 0.72 | 0.00 |
| Channel X - Input | -20003.19 | 2.57 | -0.01 |
| Channel Y + Input | 200031.04 | -2.35 | -0.00 |
| Channel Y + Input | 20004.17 | -0.10 | -0.00 |
| Channel Y - Input | -20006.05 | -0.28 | 0.00 |
| Channel Z + Input | 200033.38 | -0.04 | -0.00 |
| Channel Z + Input | 20003,27 | -0.97 | -0.00 |
| Channel Z - Input | -20007.67 | -1.85 | 0.01 |

| Low Range | Reading (µV) | Difference (µV) | Error (%) |
|-------------------|--------------|-----------------|-----------|
| Channel X + Input | 2000.34 | -0.06 | -0.00 |
| Channel X + Input | 201.28 | 0.95 | 0.47 |
| Channel X - Input | -198.35 | 1.25 | -0.63 |
| Channel Y + Input | 2000.88 | 0.54 | 0.03 |
| Channel Y + Input | 199.53 | -0.80 | -0.40 |
| Channel Y - Input | -200.22 | -0.64 | 0.32 |
| Channel Z + Input | 2000,27 | 0.04 | 0.00 |
| Channel Z + Input | 198.83 | -1.41 | -0.70 |
| Channel Z - Input | -200.94 | -1.26 | 0.63 |
| | | | |

2. Common mode sensitivity

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

| | Common mode Input Voltage (mV) | High Range Average Reading (μV) | Low Range Average Reading (μV) |
|-----------|-----------------------------------|------------------------------------|-----------------------------------|
| Channel X | 200 | 29.02 | 27.07 |
| | - 200 | -24.87 | -27.14 |
| Channel Y | 200 | -18.44 | -18.59 |
| | - 200 | 18.33 | 18.03 |
| Channel Z | 200 | 15.00 | 15.39 |
| | - 200 | -18,17 | -18.23 |

3. Channel separation

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

| | Input Voltage (mV) | Channel X (µV) | Channel Y (µV) | Channel Z (μV) |
|-----------|--------------------|----------------|----------------|----------------|
| Channel X | 200 | - 2- | -1.16 | -4.49 |
| Channel Y | 200 | 7.88 | | 1.01 |
| Channel Z | 200 | 10.65 | 4.72 | - |

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AD-Converter Values with inputs shorted

DASY measurement parameters: Auto Zero Time; 3 sec; Measuring time; 3 sec

| | High Range (LSB) | Low Range (LSB) |
|-----------|------------------|-----------------|
| Channel X | 16017 | 16757 |
| Channel Y | 15556 | 15598 |
| Channel Z | 15950 | 16735 |

5. Input Offset Measurement

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

Input 10MO

| | Average (μV) | min. Offset (μV) | max. Offset (μV) | Std. Deviation (µV) |
|-----------|--------------|------------------|------------------|---------------------|
| Channel X | 0.90 | +0.03 | 1.89 | 0.40 |
| Channel Y | 0.57 | -0.29 | 1.64 | 0.37 |
| Channel Z | -1.27 | -2.75 | 0.35 | 0.59 |

6. Input Offset Current

Nominal Input circuitry offset current on all channels: <25fA

7. Input Resistance (Typical values for Information)

| | Zeroing (kOhm) | Measuring (MOhm) |
|-----------|----------------|------------------|
| Channel X | 200 | 200 |
| Channel Y | 200 | 200 |
| Channel Z | 200 | 200 |

8. Low Battery Alarm Voltage (Typical values for Information)

| Typical values | Álarm Level (VDC) | |
|----------------|-------------------|--|
| Supply (+ Vcc) | +7.9 | |
| Supply (- Vcc) | -7.6 | |

9. Power Consumption (Typical values for information)

| Typical values | Switched off (mA) | Stand by (mA) | Transmitting (mA) |
|----------------|-------------------|---------------|-------------------|
| Supply (+ Vcc) | +0.01 | +6 | +14 |
| Supply (- Vcc) | -0.01 | -8 | -9 |

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SGS-TW (Auden)

Certificate No. EX3-7466 Jul 17

CALIBRATION CERTIFICATE EX3DV4 - SN:7466 Check

Calibration (indexionals).

QA GAL-01.v9, QA CAL-14.v4, QA CAL-23.v5, QA CAL-25.v6

Calibration procedure for dosimetric E-field probes

July 4, 2017 Castrition cate

This collination certificate documents the precedebity to network standards, which relates the physical units of measurements (81) asurements and the uncertainties with confidence protability are given on the following pages and are part of the confliction.

All calibrations have been conducted in the closed laboratory facility: unvironment temperature (22 ± 3)°C and humidity < 70%

Calibration Equipment used (MSTE critical for calibration)

| Primary Standards | (D | Cal Date (Certificate No.) | Scheduled Caribration |
|----------------------------|------------------|------------------------------------|-------------------------|
| Power meter NRP | SN: 104778 | 04-Apr-17 (No. 217-02521/02522) | Apr-18 |
| Power sensor NRP-Z91 | SN: 103244 | 94-Api-17 (No. 217-02521): | April 18 |
| Power sensor MRP-Z91 | SN: 103245 | 04-Apr-17 (No. 217-02525) | Apr-18 |
| Reference 20 dB Afteruator | SN: 58277 (20x) | 07-Apr-17 (No. 217-02528) | Apr-18 |
| Reference Probe EB3DV2 | SN 3013 | 21-Dep-16 (No. ES3-3013_Dep16) | Dec-17 |
| DAE4 | SN. 660 | 7-Dan-16 (No. DAE4-650_Dec15) | Dec-17 |
| Secondary Standards | 0 | Check Date (in house) | Scheduled Check |
| Power meter E44198 | -SN: G841293674 | Ob-Apr-16 (in house chack dury-16) | by house chuck: Jun-18 |
| Power sensor E4412A | SN: MY41498087 | CB-Apr-18 (in house check dun-16) | In house chack: Jun-18 |
| Power sersor E4412A | SN:000110210 | 06-Apr-16 (in house check Jun-16) | In house of ecc. Jun-18 |
| RE generator HP 8648Q | EN: US3642U01700 | (M-Aug-89 (in figure check Jun-16) | In house check Jun-19 |
| Network Analyzes HP 8753E | SN: US37290585 | 18-Cid-O1 (in house check Oid-16) | In house check: Gd-17 |

| | Name | Function | Signature |
|----------------|---------------|------------------------|----------------------|
| Californiad by | Lut Kilyemeri | Enterentiny Technology | Sef Elge |
| Агримен бу | Каца Рокило | Tecopical Menigen | All g |
| | | | (squed: July 0, 2017 |

Germann No. EX3-7486_Jul17

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Glossary:

Connector Angle

lissue simulating fiquid NORMs,y.z. sensitivity in free space sensitivity in TSL / NORMx,y,z. DCP

diode compression point crest factor (1/duty_cycle) of the RF signal W. B. C. D modulation dependent linearization parameters

protation around probe axis Potenzation o

Polarization 5 It rotation around an owis that is in the plane normal to probe axis (at measurement center).

= 8 = 0 is normal to pribe axis information used in DASY system to sign probe sensor X to the robot coordinate system

Calibration is Performed According to the Following Standards:

- a) (EEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013 IEC 02209-1," "Measurement procedure for the assessment of Specific Absorption Rate (SAR) from hand-
- 35 b) IEC 022(9-1, "Measurement procedure for the assessment of specific Assorption Rate (SAR) from nanoheld and body-mounted devices used next to the ser (frequency range of 300 MHz to 6 GHz)", July 2016.
 c) IEC 622(9-2, "Procedure to determine the Specific Absorption Rate (SAR) for weeks communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)". March 2010.
 d) KDB 865664, "SAR Messurement Requirements for 100 MHz to 6 GHz."

Methods Applied and Interpretation of Parameters:

- NORMx,y,z: Assessed for E-field polarization (i = 0 (f < 900 MHz in TEM-cell; f > 1800 MHz: R22 waveguide). NORMx, y, z are only intermediate values, i.e., the uncartainties of NORMx, y, z does not affect the E¹-field
- uncertainty inside TSL (see below ConvF).

 NORM(f)x,y,z = NORMx,y,z * frequency_response (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of ConvF.
- DCPx,y, z. DCP are numerical linearization parameters assessed based on the data of power sweep with CW signal (no uncertainty required). DCP does not depend on frequency nor media.
- PAR: PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics
- A_{A,Y,Z}, Ex,y,z, Cx,y,z, Dx,y,z, VRx,y,z, A, B, C, D are numerical linearization parameters assessed based on
- Any, Y, Exc, Y, Z, Dx, Y, Z, Vxx, Y, X, X, B, C, D are numerical interaction parameters assessed baset or the date of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. VR is the maximum calibration range expressed in RMS voltage across the didos.

 ConvF and Boundary Effect Parameters: Assessed in flat phantom using E-feet (or Tempereture Transfer Standard for I < 800 MHz) and inside waveguide using analytical field distributions based on power measurements for I > 800 MHz. The same setups are used for assessment of the parameters applied to boundary companisation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASYA software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to NORMx,y,z "Convi" whereby the uncertainty corresponds to that given for ConvF. A frequency dependent and in DASY version 4.4 and higher which allows extending the validity from \pm 50 MHz to \pm 100 MHz
- Spherical (sotropy (3D deviation from isotropy); in a field of low gradients realized using a fial phantom exposed by a patch antenna.
- Sensor Offset. The sensor offset corresponds to the offset of virtual measurement center from the probe to
- (on probe axis). No sclerance required.

 Connector Angle: The angle is assessed using the information gained by determining the WORM's (no uncertainty required).

Certificate No: EX3-7466_Jul 17

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EX3DV4 - SN:7466

July 4, 2017

Probe EX3DV4

SN:7466

Manufactured: October 25, 2016 Calibrated: July 4, 2017

Calibrated for DASY/EASY Systems (Note: non-competible with DASY2 system!)

Certificate No: EX3-7466_Jul17

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EX3DV4-SN:7466

July 4, 2017

DASY/EASY - Parameters of Probe: EX3DV4 - SN:7466

Basic Calibration Parameters

| | Sensor X | Sensor Y | Sensor Z | Unc (k=2) |
|--|----------|----------|----------|-----------|
| Norm (µV/(V/m) ²) ^A | 0.46 | 0.40 | 0.63 | ± 10.1 % |
| DCP (mV) ^a | 96.7 | 100.3 | 93.7 | |

Modulation Calibration Parameters

| UID | Communication System Name | | A dB | B dB√μV | С | D dB | VR mV | Uno ^E (k=2) |
|-----|---------------------------|---|---------|------------|-----|---------|----------|---------------------------|
| 0 | CW | X | 0.0 | 0.0 | 1.0 | 0.00 | 145.9 | ±3.0 % |
| | | Y | 0.0 | 0.0 | 1.0 | | 148.6 | |
| | | Z | 0.0 | 0.0 | 1.0 | | 130.0 | |

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

Certificate No: EX3-7466_Jul17

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The uncertainties of Norm X,Y,Z do not affect the E²-field uncertainty inside TSL (see Pages 5 and 6).
*Numerical linearization parameter: uncertainty not required.
*Uncertainty is determined using the max, deviation from linear response applying rectangular distribution and is expressed for the square of the



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EX3DV4-- SN:7466

July 4, 2017

DASY/EASY - Parameters of Probe: EX3DV4 - SN:7466

Calibration Parameter Determined in Head Tissue Simulating Media

| alibration | Parameter De | etermineu m | neau iii | suc Simi | ulating m | edia | | |
|----------------------|---------------------------------------|-------------------------|----------|----------|-----------|--------------------|----------------------------|--------------|
| f (MHz) ^C | Relative Permittivity ^F | Conductivity (S/m) F | ConvF X | ConvF Y | ConvF Z | Alpha ^G | Depth ⁶ (mm) | Unc (k=2) |
| 835 | 41.5 | 0.90 | 10.20 | 10.20 | 10.20 | 0.60 | 0.84 | ± 12.0 % |
| 900 | 41.5 | 0.97 | 9.95 | 9.95 | 9.95 | 0.42 | 0.94 | ± 12.0 % |
| 1750 | 40.1 | 1.37 | 8.84 | 8.84 | 8.84 | 0.34 | 0.80 | ± 12.0 % |
| 1900 | 40.0 | 1.40 | 8.52 | 8.52 | 8.52 | 0.35 | 0.80 | ± 12.0 % |
| 2000 | 40.0 | 1.40 | 8.47 | 8.47 | 8.47 | 0.35 | 0.80 | ± 12.0 % |
| 2450 | 39.2 | 1.80 | 7.81 | 7.81 | 7.81 | 0.35 | 0.99 | ± 12.0 % |
| 2600 | 39.0 | 1.96 | 7.58 | 7.58 | 7.58 | 0.37 | 0.95 | ± 12.0 % |
| 5200 | 36.0 | 4.66 | 5.81 | 5.81 | 5.81 | 0.35 | 1.80 | ± 13.1 % |
| 5300 | 35.9 | 4.76 | 5.56 | 5.56 | 5.56 | 0.35 | 1.80 | ± 13.1 % |
| 5600 | 35.5 | 6.07 | 4.98 | 4.98 | 4.98 | 0.40 | 1.80 | ±13.1 % |
| 5800 | 35.3 | 5.27 | 5.17 | 5.17 | 5.17 | 0.40 | 1.80 | ±13.1% |

⁰ Frequency validity above 300 MHz of ± 160 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the 1635 of the Conv² uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for Conv² assessments at 30, 44, 120, 150 and 220 MHz respectively. Above 5 GHz frequency validity can be extended to ± 510 MHz.

*At frequencies below 3 GHz, the validity of tissue parameters (a and e) can be relaxed to ± 10% if figuid compensation formula is applied to measured SAR values. At frequencies shows 3 GHz, the validity of tissue parameters (a and e) is restricted to ± 5%. The uncertainty for hidded target tissue parameters.

*AphaCogha are determined during outbrades. SFEAC warrants that the remaining deviation due to the boundary effect after compensation is always lass than ± 1% for frequencies below 3 GHz and below a 2% for frequencies between 3-6 GHz at any distance larger than half the probe 5p dismeter from the boundary.

Certificate No: EX3-7466_Jul17

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July 4, 2017

EX3DV4-SN:7466

DASY/EASY - Parameters of Probe: EX3DV4 - SN:7466

Calibration Parameter Determined in Body Tissue Simulating Media

| alibration | libration Parameter Determined in Body Tissue Simulating Media | | | | | | | | | |
|----------------------|--|-----------------------|---------|---------|---------|--------------------|----------------------------|--------------|--|--|
| f (MHz) ^C | Relative Permittivity F | Conductivity (S/m) | ConvF X | ConvF Y | ConvF Z | Alpha ⁶ | Depth ^G (mm) | Unc (k=2) | | |
| 835 | 55.2 | 0.97 | 10.24 | 10.24 | 10.24 | 0.39 | 0.96 | ± 12.0 % | | |
| 900 | 55.0 | 1.05 | 10.06 | 10.06 | 10.06 | 0.34 | 1.01 | ± 12.0 % | | |
| 1750 | 53.4 | 1.49 | 8.52 | 8.52 | 8.52 | 0.39 | 0.87 | ± 12.0 % | | |
| 1900 | 53.3 | 1.52 | 8.14 | 8.14 | 8.14 | 0.34 | 0.91 | ± 12.0 % | | |
| 2000 | 53.3 | 1.52 | 8.30 | 8.30 | 8.30 | 0.33 | 0.94 | ± 12.0 % | | |
| 2450 | 52.7 | 1.95 | 7.94 | 7.94 | 7.94 | 0.28 | 1.10 | ± 12.0 % | | |
| 2600 | 52.5 | 2.16 | 7.66 | 7.66 | 7.66 | 0.27 | 1.15 | ± 12.0 % | | |
| 5200 | 49.0 | 5.30 | 5.20 | 5.20 | 5.20 | 0.40 | 1.90 | ± 13.1 % | | |
| 5300 | 48.9 | 5.42 | 5.10 | 5.10 | 5.10 | 0.40 | 1.90 | ± 13.1 % | | |
| 5600 | 48.5 | 5.77 | 4.27 | 4.27 | 4.27 | 0.50 | 1.90 | ± 13.1 % | | |
| 5800 | 48.2 | 6.00 | 4.48 | 4.48 | 4.48 | 0.50 | 1.90 | ±13.1% | | |

[©] Firequency validity above 360 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), alse it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at disfuscion frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Above 5 GHz frequency validity on the extended to ± 110 MHz.

*At frequencies below 3 GHz, the validity of tissue parameters (e and e) can be relaxed to ± 10% if liquid componsation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (e and e) is restricted to ± 6%. The uncertainty is the RSS of the ConvF uncertainty for indicated torget tissue parameters. If a tissue parameters is the convF uncertainty for indicated torget tissue parameters.

*Application and the convF uncertainty is the RSS of the ConvF uncertainty is the RSS of the ConvF uncertainty in indicated torget tissue parameters.

*Application are converted to ± 6%. The uncertainty is the RSS of the ConvF uncertainty in indicated torget tissue parameters.

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Certificate No: EX3-7466_Jul17 Page 6 of 11

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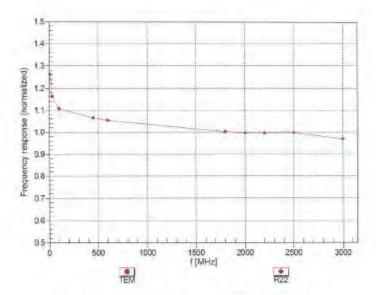


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EX3DV4- SN:7466

July 4, 2017

Frequency Response of E-Field (TEM-Cell:ifi110 EXX, Waveguide: R22)



Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

Certificate No: EX3-7466_Jul17

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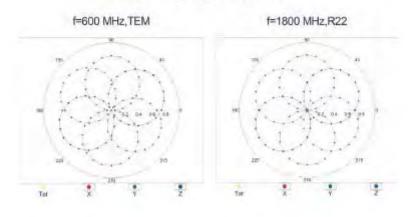
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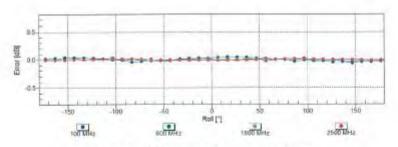


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EX3DV4-SN:7466 July 4, 2017

Receiving Pattern (6), 9 = 0°





Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

Conficate No: EX3-7468_Jul17

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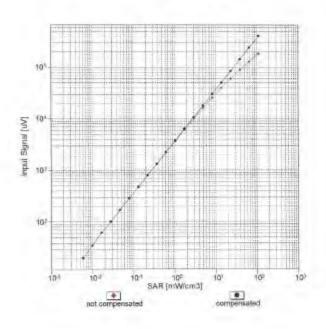


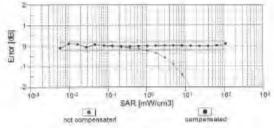
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EX3DV4- SN:7466

July 4, 2017.

Dynamic Range f(SAR_{head}) (TEM cell , f_{eval}= 1900 MHz)





Uncertainty of Linearity Assessment: ± 0.6% (k=2)

Cartificate No. EX3-7466_Jul 17

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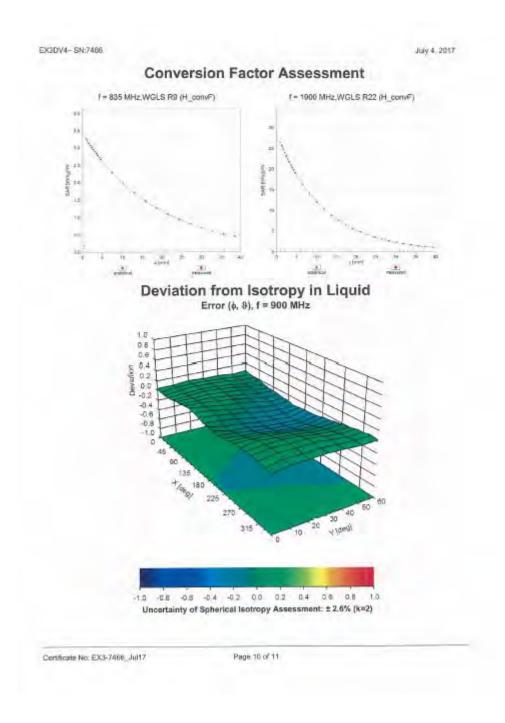
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EX3DV4~ SN:7466

July 4, 2017

DASY/EASY - Parameters of Probe: EX3DV4 - SN:7466

Other Probe Parameters

| Sensor Arrangement | Triangular |
|---|------------|
| Connector Angle (°) | -3.3 |
| Mechanical Surface Detection Mode | enabled |
| Optical Surface Detection Mode | disabled |
| Probe Overall Length | 337 mm |
| Probe Body Diameter | 10 mm |
| Tip Length | 9 mm |
| Tip Diameter | 2.5 mm |
| Probe Tip to Sensor X Calibration Point | 1 mm |
| Probe Tip to Sensor Y Calibration Point | 1 mm |
| Probe Tip to Sensor Z Calibration Point | 1 mm |
| Recommended Measurement Distance from Surface | 1.4 mm |

Page 11 of 11 Certificate No: EX3-7466 Jul17

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SGS-TW (Auden)

Certificate No: EX3-3938_Sep17

CALIBRATION CERTIFICATE EX3DV4 - SN:3938 Object QA CAL-01 v9, QA CAL-14.v4, QA CAL-23.v5, QA CAL-25.v6 Calibration procedure(s) Calibration procedure for dosimetric E-field probes Calibration date: September 29, 2017 This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI). The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate All calibrations have been conducted in the closed laboratory facility, environment temperature (22 ± 3)°C and humidity < 70% Calibration Equipment used (M&TE critical for calibration)

| Primary Standards | (D) | Cal Date (Certificate No.) | Scheduled Calibration |
|----------------------------|------------------|-----------------------------------|------------------------|
| Power meter NRP | SN: 104778 | 04-Apr-17 (No. 217-02521/02522) | Apr.18 |
| Power sensor NRP-Z91 | SN: 103244 | 04-Apr-17 (No. 217-02521) | Apr-18 |
| Power sensor NRP-Z91 | SN: 103245 | 04-Apr-17 (No. 217-02525) | Apr-18 |
| Reference 20 dB Attenuator | SN: S5277 (20x) | 07-Apr-17 (No. 217-02528) | Apr-18 |
| Reference Proba ES3DV2 | SN: 3013 | 31-Dec-16 (No. ES3-3013_Dec16) | Dec-17 |
| DAE4 | SN: 660 | 7-Dec-16 (No. DAE4-660_Dec18) | Dec-17 |
| Secondary Standards | ID | Check Date (in house) | Scheduled Check |
| Power meter E4419B | SN: GB41293874 | 06-Apr-16 (in house check Jun-18) | In house check: Jun-18 |
| Power sensor E4412A | SN: MY41498087 | 06-Apr-16 (in house check Jun-18) | In house check: Jun-18 |
| Power sensor E4412A | SN: 000110210 | 06-Apr-16 (in house check Jun-16) | In house check: Jun-18 |
| RF generator HP 8648C | SN: US3642U01700 | 04-Aug-99 (in house check Jun-16) | In house check: Jun-18 |
| Network Analyzer HP 8753E | SN: US37390585 | 18-Oct-01 (in house check Oct-16) | In house check: Oct-17 |

| | Name | Function | Signature |
|----------------|----------------|-----------------------|-------------------------|
| Calibrated by: | Jeton Kaştrati | Laboratory Technician | THE |
| Approved by: | Katja Pokovjc | Technical Manager | Reac |
| | | | Issued: October 2, 2017 |

Certificate No: EX3-3938 Sep17

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Accreditation No.: SCS 0108

Accredited by the Swiss Accreditation Service (SAS)

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Glossary:

tissue simulating liquid NORMx,y,z sensitivity in free space sensitivity in TSL / NORMx,y,z ConvF DCP

diode compression point crest factor (1/duty_cycle) of the RF signal modulation dependent linearization parameters A.B.C.D

Polarization φ in rotation around probe axis

Polarization 9 & rotation around an axis that is in the plane normal to probe axis (at measurement center),

i.e., 4 = 0 is normal to probe axis

information used in DASY system to align probe sensor X to the robot coordinate system Connector Angle

Calibration is Performed According to the Following Standards:

- IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement
- Techniques", June 2013 IEC 62209-1, ", "Measurement procedure for the assessment of Specific Absorption Rate (SAR) from hand-b) IEC 62209-1, ", "Measurement procedure for the assessment of specific Absorption Nate (SAN) from near held and body-mounted devices used next to the ear (frequency range of 300 MHz to 5 GHz)", July 2016.
 c) IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for Wireless communication defused in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010.
 d) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Methods Applied and Interpretation of Parameters:

- NORMx,y,z Assessed for E-field polarization 8 = 0 (f ≤ 900 MHz in TEM-cell; f > 1800 MHz: R22 waveguide). NORMx,y,z are only intermediate values, i.e., the uncertainties of NORMx,y,z does not affect the E^2 -field uncertainty inside TSL (see below ConvF).
- NORM(f),x,y,z = NORMx,y,z * frequency_response (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included
- in the stated uncertainty of ConvF.

 DCPx;y,z: DCP are numerical linearization parameters assessed based on the data of power sweep with CW signal (no uncertainty required). DCP does not depend on frequency nor media.

 PAR: PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal has referred.
- Axy z: Bx,y,z; Cx,y,z; Dx,y,z; VRx,y,z; A, B, C, D are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. VR is the maximum calibration range expressed in RMS voltage across the diode.
- ConvF and Boundary Effect Parameters: Assessed in flat phantom using E-field (or Temperature Transfer Standard for f < 800 MHz) and inside waveguide using analytical field distributions based on power measurements for f > 800 MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to NORMx,y,z **ConvF* whereby the uncertainty corresponds to that given for ConvF. A frequency dependent ConvF* is used in DASY version 4.4 and higher which allows extending the validity from ± 50 MHz to ± 100 MHz.
- Spherical isotropy (3D deviation from isotropy): in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- Sensor Offset: The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.
- Connector Angle: The angle is assessed using the information gained by determining the NORMx (no uncertainty required).

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EX3DV4 - SN:3938

September 29, 2017

Probe EX3DV4

SN:3938

Manufactured: Calibrated:

May 2, 2013

September 29, 2017

Calibrated for DASY/EASY Systems (Note: non-compatible with DASY2 system!)

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September 29, 2017

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3938

Basic Calibration Parameters

| | Sensor X | Sensor Y | Sensor Z | Unc (k=2) |
|--|----------|----------|----------|-----------|
| Norm (µV/(V/m) ²) ^A | 0.51 | 0.57 | 0.33 | ± 10.1 % |
| DCP (mV) ^F | 102.0 | 101.2 | 103.4 | |

Modulation Calibration Parameters

| UID | To the state of th | | A dB | B dBõV | C | D dB | VR mV | Unc ^E (k=2) |
|-----|--|---|---------|-----------|-----|---------|----------|---------------------------|
| 0 | CW | X | 0.0 | 0.0 | 1:0 | 0.00 | 139.3 | ±2.5 % |
| | | Y | 0.0 | 0.0 | 1.0 | | 146.0 | - |
| | | 2 | 0.0 | 0.0 | 1.0 | | 131.9 | |

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

The uncertainties of Norm X,Y,Z,do not affect the E^S-field uncertainty inside TSL (see Pages 5 and 6).

Numerical linearization parameter, uncertainty not required.

Linearization is determined using the max, deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

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EX3DV4- SN:3938

September 29, 2017

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3938

Calibration Parameter Determined in Head Tissue Simulating Media

| f (MHz) [©] | Relative Permittivity ^F | Conductivity (S/m) | ConvF X | ConvF Y | ConvF Z | Alpha ^G | Depth ^C (mm) | Unc (k=2) |
|----------------------|---------------------------------------|-----------------------|---------|---------|---------|--------------------|----------------------------|--------------|
| 750 | 41.9 | 0.89 | 10.26 | 10.26 | 10.26 | 0.53 | 0.80 | ± 12.0 % |
| 835 | 41.5 | 0.90 | 9.69 | 9.69 | 9.69 | 0.50 | 0.83 | ± 12.0 % |
| 900 | 41.5 | 0.97 | 9.50 | 9,50 | 9.50 | 0.51 | 0.80 | ± 12.0 % |
| 1450 | 40.5 | 1.20 | 8.49 | 8.49 | 8.49 | 0.45 | 0.80 | ± 12.0 % |
| 1750 | 40,1 | 1.37 | 8.35 | 8.35 | 8.35 | 0.33 | 0.85 | ± 12.0 % |
| 1900 | 40.0 | 1.40 | 8.07 | 8.07 | 8.07 | 0.36 | 0,84 | ± 12.0 % |
| 2000 | 40.0 | 1.40 | 8.04 | 8.04 | 8.04 | 0.30 | 0.86 | ± 12.0 % |
| 2300 | 39.5 | 1.67 | 7.66 | 7.66 | 7.66 | 0.32 | 0.84 | ± 12.0 % |
| 2450 | 39.2 | 1.80 | 7.30 | 7.30 | 7.30 | 0.37 | 0.80 | ± 12.0 % |
| 2600 | 39.0 | 1.96 | 7.14 | 7.14 | 7.14 | 0.33 | 0.86 | ±12.09 |
| 5250 | 35.9 | 4.71 | 5.04 | 5.04 | 5.04 | 0.35 | 1.80 | ± 13.1 % |
| 5600 | 35.5 | 5.07 | 4.70 | 4.70 | 4.70 | 0.40 | 1.80 | ± 13.1 % |
| 5750 | 35.4 | 5.22 | 4.85 | 4.85 | 4.85 | 0.40 | 1.80 | ± 13,1 % |

Enguency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the CornF encertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for CornF assessments at 30, 64, 128, 150 and 220 MHz respectively. Above 5 GHz frequency validity can be extended to ± 110 MHz.

At frequencies below 3 GHz, the validity of tissue parameters (a and o) can be reased to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the varidity of tissue parameters (i) and b) is restricted to ± 5%. The uncertainty is the RSS of the CornF uncertainty for indicated target tissue parameters.

Applications of the determined during calibration. SFEAC warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

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DASY/EASY - Parameters of Probe: EX3DV4 - SN:3938

| f (MHz) c | Relative Permittivity F | Conductivity (S/m) F | ConvF X | ConvF Y | ConvF Z | Alpha ^G | Depth ^G (mm) | Unc (k=2) |
|-----------|----------------------------|-------------------------|---------|---------|---------|--------------------|----------------------------|--------------|
| 750 | 55.5 | 0.96 | 9.62 | 9.62 | 9.62 | 0,51 | 0.80 | ± 12.0 % |
| 835 | 55.2 | 0.97 | 9.48 | 9.48 | 9.48 | 0.50 | 0.83 | ± 12.0 % |
| 900 | 55.0 | 1.05 | 9,35 | 9,35 | 9.35 | 0.55 | 0.80 | ± 12.0 % |
| 1450 | 54.0 | 1,30 | 8.29 | 8.29 | 8.29 | 0.36 | 0.80 | ± 12.0 % |
| 1750 | 53.4 | 1.49 | 7.96 | 7.96 | 7.96 | 0.45 | 0.80 | ± 12.0 % |
| 1900 | 53.3 | 1.52 | 7.70 | 7.70 | 7.70 | 0.40 | 0.80 | ± 12.0 % |
| 2000 | 53.3 | 1.52 | 7.87 | 7.87 | 7.87 | 0,38 | 0.86 | ± 12.0 % |
| 2300 | 52.9 | 1,81 | 7.51 | 7.51 | 7.51 | 0.41 | 0.85 | ± 12.0 % |
| 2450 | 52.7 | 1,95 | 7.42 | 7.42 | 7.42 | 0.39 | 0.80 | ± 12.0 % |
| 2600 | 52.5 | 2.16 | 7.15 | 7.15 | 7.15 | 0.35 | 0.89 | ± 12.0 % |
| 5250 | 48.9 | 5.36 | 4.41 | 4.41 | 4.41 | 0.40 | 1.90 | ±13.19 |
| 5600 | 48.5 | 5.77 | 3.90 | 3.90 | 3.90 | 0.45 | 1.90 | ±13.19 |
| 5750 | 48.3 | 5.94 | 4.09 | 4.09 | 4.09 | 0.45 | 1.90 | ± 13.19 |

Frequency validity above 300 MHz of ± 100 MHz only applies for DAS'Y v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at delibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Above 5 GHz frequency validity can be extended to a ± 10 MHz.

At frequencies below 3 GHz, the validity of tissue parameters (is and e) can be released to ± 10%, if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (is and e) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target itssue parameters are the convF uncertainty for indicated target itssue parameters are sufficiently as the RSS of the ConvF uncertainty for indicated target itssue parameters.

Applications are determined during calibration. SPEAC warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

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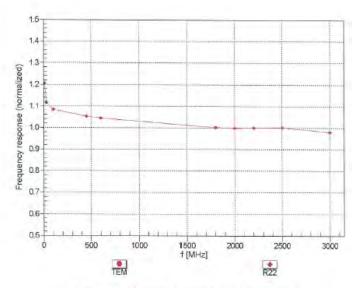


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September 29, 2017

Frequency Response of E-Field (TEM-Cell:ifi110 EXX, Waveguide: R22)



Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

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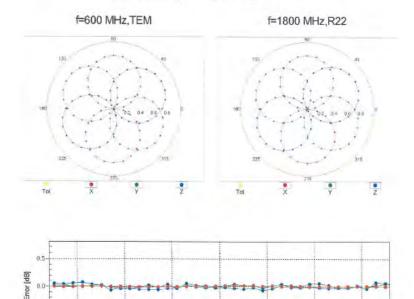
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Receiving Pattern (\$), 9 = 0°



Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

600 MHz

Roll ["]

1800 MHz

2500 MHz

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100 MHz

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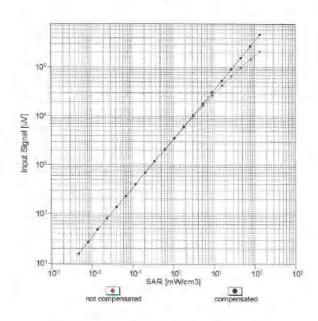


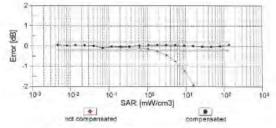
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September 29, 2017

Dynamic Range f(SARhead) (TEM cell , feval= 1900 MHz)





Uncertainty of Linearity Assessment: ± 0.6% (k=2)

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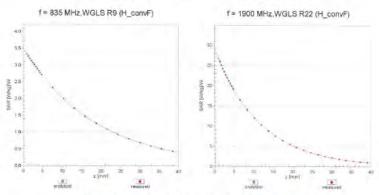
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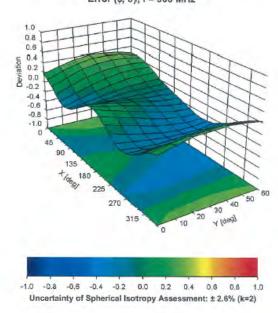
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Conversion Factor Assessment



Deviation from Isotropy in Liquid Error (ø, θ), f = 900 MHz



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DASY/EASY - Parameters of Probe: EX3DV4 - SN:3938

Other Probe Parameters

| Triangular |
|------------|
| -24.6 |
| enabled |
| disabled |
| 337 mm |
| 10 mm |
| 9 mm |
| 2,5 mm |
| 1 mm |
| 1 mm |
| 1 mm |
| 1.4 mm |
| |

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8. Uncertainty Budget

Measurement Uncertainty evaluation template for DUT SAR test (3-6G)

| Α | С | D | е | | f | g | h=c * f / e | i=c * g / e | k |
|---|---------------------------|-----------------|-----|-----------|---------|----------|-------------------------|-------------------------|-------------|
| Source of Uncertainty | Tolerance/ Uncertainty | Probabilit y | Div | Div Value | ci (1g) | ci (10g) | Standard uncertainty | Standard uncertainty | vi, or Veff |
| Measurement system | | | | | | | | | |
| Probe calibration | 6.55% | N | 1 | 1 | 1 | 1 | 6.55% | 6.55% | œ |
| Isotropy , Axial | 3.50% | R | √3 | 1.732 | 1 | 1 | 2.02% | 2.02% | œ |
| Isotropy, Hemispherical | 9.60% | R | √3 | 1.732 | 1 | 1 | 5.54% | 5.54% | œ |
| Modulation Response | 2.40% | R | √3 | 1.732 | 1 | 1 | 1.40% | 1.40% | ∞ |
| Boundary Effect | 1.00% | R | √3 | 1.732 | 1 | 1 | 0.58% | 0.58% | œ |
| Linearity | 4.70% | R | √3 | 1.732 | 1 | 1 | 2.71% | 2.71% | ∞ |
| Detection Limits | 1.00% | R | √3 | 1.732 | 1 | 1 | 0.58% | 0.58% | œ |
| Readout Electronics | 0.30% | N | 1 | 1 | 1 | 1 | 0.30% | 0.30% | œ |
| Response time | 0.80% | R | √3 | 1.732 | 1 | 1 | 0.46% | 0.46% | œ |
| Integration Time | 2.60% | R | √3 | 1.732 | 1 | 1 | 1.50% | 1.50% | œ |
| Measurement drift (class A evaluation) | 1.75% | R | √3 | 1.732 | 1 | 1 | 1.01% | 1.01% | œ |
| RF ambient condition - noise | 3.00% | R | √3 | 1.732 | 1 | 1 | 1.73% | 1.73% | œ |
| RF ambient conditions - reflections | 3.00% | R | √3 | 1.732 | 1 | 1 | 1.73% | 1.73% | œ |
| Probe positioner Mechanical restrictions | 0.40% | R | √3 | 1.732 | 1 | 1 | 0.23% | 0.23% | œ |
| Probe Positioning with respect to phantom | 2.90% | R | √3 | 1.732 | 1 | 1 | 1.67% | 1.67% | œ |
| Post-processing | 1.00% | R | √3 | 1.732 | 1 | 1 | 0.58% | 0.58% | œ |
| Max SAR Eval | 1.00% | R | √3 | 1.732 | 1 | 1 | 0.58% | 0.58% | œ |
| Test Sample related | | | | | | | | | |
| Test sample positioning | 2.90% | N | 1 | 1 | 1 | 1 | 2.90% | 2.90% | M-1 |
| Device Holder Uncertainty | 3.60% | N | 1 | 1 | 1 | 1 | 3.60% | 3.60% | M-1 |
| Drift of output power | 5.00% | R | √3 | 1.732 | 1 | 1 | 2.89% | 2.89% | œ |
| Phantom and Setup | | | | | | | | | |
| Phantom Uncertainty | 4.00% | R | √3 | 1.732 | 1 | 1 | 2.31% | 2.31% | œ |
| Liquid permittivity (mea.) | 2.56% | N | 1 | 1 | 0.64 | 0.43 | 1.64% | 1.10% | М |
| Liquid Conductivity (mea.) | 3.18% | N | 1 | 1 | 0.6 | 0.49 | 1.91% | 1.56% | М |
| Combined standard uncertainty | | RSS | | | | | 11.98% | 11.86% | |
| Expant uncertainty | | | | | | | 23.97% | 23.72% | |

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.

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Measurement Uncertainty evaluation template for DUT SAR test (0.3-3G)

| A | С | D | е | | f | g | h=c * f / e | i=c * g / e | k |
|---|---------------------------|-----------------|-----|-----------|---------|----------|----------------------|----------------------|------------|
| Source of Uncertainty | Tolerance/ Uncertainty | Probabilit y | Div | Div Value | ci (1g) | ci (10g) | Standard uncertainty | Standard uncertainty | vi, or Vef |
| Measurement system | | | | | | | | | |
| Probe calibration | 6.00% | N | 1 | 1 | 1 | 1 | 6.00% | 6.00% | ∞ |
| Isotropy , Axial | 3.50% | R | √3 | 1.732 | 1 | 1 | 2.02% | 2.02% | ∞ |
| lsotropy, Hemispherical | 9.60% | R | √3 | 1.732 | 1 | 1 | 5.54% | 5.54% | ∞ |
| Modulation Response | 2.40% | R | √3 | 1.732 | 1 | 1 | 1.40% | 1.40% | ∞ |
| Boundary Effect | 1.00% | R | √3 | 1.732 | 1 | 1 | 0.58% | 0.58% | ∞ |
| Linearity | 4.70% | R | √3 | 1.732 | 1 | 1 | 2.71% | 2.71% | ∞ |
| Detection Limits | 1.00% | R | √3 | 1.732 | 1 | 1 | 0.58% | 0.58% | ∞ |
| Readout Electronics | 0.30% | N | 1 | 1 | 1 | 1 | 0.30% | 0.30% | ∞ |
| Response time | 0.80% | R | √3 | 1.732 | 1 | 1 | 0.46% | 0.46% | ∞ |
| Integration Time | 2.60% | R | √3 | 1.732 | 1 | 1 | 1.50% | 1.50% | ∞ |
| Measurement drift (class A evaluation) | 1.75% | R | √3 | 1.732 | 1 | 1 | 1.01% | 1.01% | ∞ |
| RF ambient condition - noise | 3.00% | R | √3 | 1.732 | 1 | 1 | 1.73% | 1.73% | ∞ |
| RF ambient conditions - reflections | 3.00% | R | √3 | 1.732 | 1 | 1 | 1.73% | 1.73% | ∞ |
| Probe positioner Mechanical restrictions | 0.40% | R | √3 | 1.732 | 1 | 1 | 0.23% | 0.23% | ∞ |
| Probe Positioning with respect to phantom | 2.90% | R | √3 | 1.732 | 1 | 1 | 1.67% | 1.67% | ∞ |
| Post-processing | 1.00% | R | √3 | 1.732 | 1 | 1 | 0.58% | 0.58% | ∞ |
| Max SAR Eval | 1.00% | R | √3 | 1.732 | 1 | 1 | 0.58% | 0.58% | ∞ |
| Test Sample related | | | | | | | | | |
| Test sample positioning | 2.90% | N | 1 | 1 | 1 | 1 | 2.90% | 2.90% | M-1 |
| Device Holder Uncertainty | 3.60% | N | 1 | 1 | 1 | 1 | 3.60% | 3.60% | M-1 |
| Drift of output power | 5.00% | R | √3 | 1.732 | 1 | 1 | 2.89% | 2.89% | ∞ |
| Phantom and Setup | | | | | | | | | |
| Phantom Uncertainty | 4.00% | R | √3 | 1.732 | 1 | 1 | 2.31% | 2.31% | ∞ |
| Liquid permittivity (mea.) | 1.81% | N | 1 | 1 | 0.64 | 0.43 | 1.16% | 0.78% | М |
| Liquid Conductivity (mea.) | 1.89% | N | 1 | 1 | 0.6 | 0.49 | 1.13% | 0.93% | М |
| Combined standard uncertainty | | RSS | | | | | 11.53% | 11.47% | |
| Expant uncertainty (95% confidence | | | | | | | 23.06% | 22.94% | |

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9. System Validation from Original Equipment Supplier

Calibration Laboratory of Schmid & Partner Engineering AG Zeughnusstraser 43, 0004 Zurich, Switzerland





- S Schweizerischer Kallbrierdiens
 C Service suisse d'étalonnage
- Servizio avizzero di taratura S Swiss Calibration Service

Accreditation No.: SCS 0108

According by the Swiss According to Service (SAS)

The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Client SGS -TW (Auden)

Total No. D2450V2-727 April 7

| | D2450V2 - SN: 7 | 27 | |
|---|--|--|---|
| Calibration procedure(s) | QA CAL-05.v9 Calibration proce | dure for dipole validation kits abo | we 700 MHz |
| calibration date. | April 21, 2017 | | |
| The measurements and the uncer | nainties with confidence p | onal standards, which realize the physical un robability are given on the following pages an | d are part of the certificate. |
| vi calibrations have been conduc Calibration Equipment used (MST | | ry facility: environment temperature (22 ± 3)*(| C and numidity < 70% |
| | 4.7 | | |
| Primary Standards | ID # | Cal Date (Certificate No.) | Scheduled Calibration |
| | ID # SN: 104778 | Cal Date (Certificate No.) 04-Apr-17 (No. 217-02521/02522) | Scheduled Calibration Apr-18 |
| ower meter NRP | | | Talle level and the level and |
| Power meter NRP Power sensor NRP-ZB1 | SN: 104778 | 04-Apr-17 (No. 217-02521/02522) | Apr-18 |
| Power meter NRP Power sensor NRP-291 Power sensor NRP-291 | SN: 104778 SN: 100244 | 04-Apr-17 (No. 217-02521/02522) 04-Apr-17 (No. 217-02521) | Apr-18 Apr-18 |
| Power meter NEIP Power sensor NEP-ZB1 Power sensor NEP-ZB1 Reference 20 dB Attanuator | SN: 104778 SN: 103244 SN: 103245 | 04-Apr-17 (No. 217-02521/02522) 04-Apr-17 (No. 217-02521) 04-Apr-17 (No. 217-02522) | Apr-18 Apr-18 Apr-18 |
| Power meter NRIP Power sensor NRIP-291 Power sensor NRIP-291 Reference 20 dB Attenuato/ Type-N mismatch combination | SN: 104778 SN: 100244 SN: 100245 SN: 5058 (20k) | 04-Apr-17 (No. 217-02521/02522) 04-Apr-17 (No. 217-02521) 04-Apr-17 (No. 217-02522) 07-Apr-17 (No. 217-02528) | Apr-18 Apr-18 Apr-18 Apr-18 |
| Power mater NRP Power sensor NRP-Z91 Power sensor NRP-Z91 Power sensor NRP-Z91 Power sensor NRP-Z91 Type-N mismatch combination Picterance Probe EX3DV4 | SN: 104778 SN: 100264 SN: 100265 SN: 5058 (20k) SN: 5047.2 / 06327 | 04-Apr-17 (No. 217-02521/02522) 04-Apr-17 (No. 217-02521) 04-Apr-17 (No. 217-02522) 07-Apr-17 (No. 217-02528) 07-Apr-17 (No. 217-02528) | Apr-18 Apr-18 Apr-18 Apr-16 Apr-18 |
| Primary Standards Power meter NRP Power sensor NRP-291 Power sensor NRP-291 Relivences 20 dB Attienuator Type-N mismatch combination Reference Probe EXSOV4 DAE4 Secondary Standards | SN: 104778 SN: 100244 SN: 100245 SN: 5058 (20k) SN: 5047.2 / 06327 SN: 7346 | 04-Apr-17 (No. 217-02521/02522) 04-Apr-17 (No. 217-02521) 04-Apr-17 (No. 217-02522) 07-Apr-17 (No. 217-02528) 07-Apr-17 (No. 217-02529) 31-Dec-16 (No. EX3-7349, Dec16) | Apr-18 Apr-18 Apr-18 Apr-16 Apr-18 Dec-17 |
| Pawer meter NRP Pawer sensor NRP-Z91 Pawer sensor NRP-Z91 Pawer sensor NRP-Z91 Palerence 20 dB Albanudo' Type-N mismatch combination Reference Probe EXSOV4 DAE4 | SN: 104778 SN: 100244 SN: 100245 SN: 5058 (20k) SN: 5047.2 / 06327 SN: 7348 SN: 601 | 04-Apr-17 (No. 217-02521/02522) 04-Apr-17 (No. 217-02521) 04-Apr-17 (No. 217-02522) 07-Apr-17 (No. 217-02528) 07-Apr-17 (No. 217-02529) 31-04c-16 (No. EX3-344, Dec16) 25-Mar-17 (No. DAE4-601_Mar17) | Apr-18 Apr-18 Apr-18 Apr-16 Apr-16 Apr-17 Mar-18 Schedulad Check |
| Power meter NRIP Power sensor NRIP-ZB1 Power sensor NRIP-ZB1 Relevances 20 dB Attenuator Type-N mismatch combination Reference Probe EXSOV4 DAE4 Secondary Standards | SN: 104778 SN: 100244 SN: 100245 SN: 5058 (20k) SN: 5047.2 / 06327 SN: 7348 SN: 601 | 04-Apr-17 (No. 217-02521/02522) 04-Apr-17 (No. 217-02521) 04-Apr-17 (No. 217-02522) 07-Apr-17 (No. 217-02528) 07-Apr-17 (No. 217-02528) 07-Apr-17 (No. 217-02529) 31-Dec-16 (No. EXX-7349, Dec-16) 28-Mar-17 (No. DAE4-601, Mar 17) Check Dato (in Incuse) | Apr-18 Apr-18 Apr-18 Apr-18 Apr-18 Dec-17 Mor-18 Schedulad Check In house check: Oct-18 |
| Power meter NRP Power sensor NRP-Z91 Power sensor NRP-Z91 Power sensor NRP-Z91 Power sensor NRP-Z91 Power meter SP Power meter Combination Poleronce Probe EX3DV4 DAE4 Secondary Standards Power meter EPM-442A Power meter EPM-442A | SN: 104778 SN: 100264 SN: 100264 SN: 5058 (20k) SN: 5058 (20k) SN: 5047.2 / 06327 SN: 7348 SN: 601 | 04-Apr-17 (No. 217-02521/02522) 04-Apr-17 (No. 217-02521) 04-Apr-17 (No. 217-02522) 07-Apr-17 (No. 217-02529) 07-Apr-17 (No. 217-02529) 31-Dec-16 (No. EX3-7349, Dec16) 28-Mar-17 (No. DAE4-601, Mar17) Check Date (in house) | Apr-18 Apr-18 Apr-18 Apr-18 Apr-18 Dec-17 Mar-18 Schedulari Check In house check: Oct-18 In house check: Oct-18 |
| Power meter NRP-ZB1 Power sensor NRP-ZB1 Power sensor NRP-ZB1 Power sensor NRP-ZB1 Power sensor NRP-ZB1 Power mensor of Attacuator Type-N mismatch combination Reference Probe EXSOV4 DAE4 Secondary Standards Power maker EPM-442A | SN: 104778 SN: 103244 SN: 103245 SN: 5058 (20k) SN: 50547.2 / 06327 SN: 7348 SN: 601 | 04-Apr-17 (No. 217-02521/02522) 04-Apr-17 (No. 217-02521) 04-Apr-17 (No. 217-02522) 07-Apr-17 (No. 217-02528) 07-Apr-17 (No. 217-02529) 31-Dec-16 (N | Apr-18 Apr-18 Apr-18 Apr-18 Apr-18 Apr-18 Dec-17 Mar-18 Schedulad Check In house check: Oct-18 In house check: Oct-18 In house check: Oct-18 |
| Power meter NRIP Power sensor NRIP-281 Power sensor NRIP-281 Relivences 20 dB Attenuator Type-N mismatch combination Relevance Probe EXSOV4 DAE4 Secondary Standards Power meter EPM-442A Power sensor HP 8481A Power sensor HP 8481A RF generator P&S SMT-06 | SN: 104778 SN: 100244 SN: 100245 SN: 5058 (20k) SN: 5047.2 / 06327 SN: 7948 SN: 601 ID # SN: GB37480704 SN: US37292783 SN: MY41092317 | 04-Apr-17 (No. 217-02521/02522) 04-Apr-17 (No. 217-02521) 04-Apr-17 (No. 217-02522) 07-Apr-17 (No. 217-02528) 07-Apr-17 (No. 217-02528) 07-Apr-17 (No. 217-02529) 31-Dec-16 (NV) EX3-7349 (Dec16) 28-Mar-17 (No. DAE4-601 (Mar 17) Check Date (in house) 07-Oc-15 (in house check Oct-16) 07-Oc-15 (in house check Oct-16) 07-Oc-15 (in house check Oct-16) | Apr-18 Apr-18 Apr-18 Apr-16 Apr-16 Apr-17 Mar-18 Schedulad Check In house check: Oct-18 In house check: Oct-18 In house check: Oct-18 In house check: Oct-18 |
| Power meter NRP Power sensor NRP-ZB1 Power sensor NRP-ZB1 Power sensor NRP-ZB1 Power sensor NRP-ZB1 Power meter SENSON4 DAE4 Secondary Standards Power meter EPM-442A Power sensor HP 8481A | SN: 104778 SN: 103244 SN: 103245 SN: 5058 (29k) SN: 5047.2 / 06327 SN: 7348 SN: 901 ID # SN: GB37480704 SN: US37292783 SN: MY41092317 SN: 100972 | 04-Apr-17 (No. 217-02521/02522) 04-Apr-17 (No. 217-02521) 04-Apr-17 (No. 217-02521) 07-Apr-17 (No. 217-02528) 07-Apr-17 (No. 217-02528) 07-Apr-17 (No. 217-02528) 07-Apr-17 (No. 217-02529) 31-Dec-16 (No. EXX-7349, Dec-16) 28-Mar-17 (No. DAE4-601, Mar 17) Check Data (in house, dec-X Oct-16) 07-Oct-16 (in house check Oct-16) 17-Oct-15 (in house check Oct-16) 15-Jun-15 (in house check Oct-16) | Apr-18 Apr-18 Apr-18 Apr-16 Apr-16 Apr-17 Mar-18 Schedulad Check In house check: Oct-18 In house check: Oct-18 In house check: Oct-18 In house check: Oct-18 |
| Power meter NRP-Z91 Power sensor NRP-Z91 Power sensor NRP-Z91 Power sensor NRP-Z91 Reterence 20 dB Affanuator Type-N mismatch combination Picterence Probe EX3DV4 DAE4 Secondary Standards Power meter EPM-442A Power sensor HP 8481A Power sensor HP 8481A RE generator P&S SMT-06 Notwork Analyzer HP 8753E | SN: 104778 SN: 100264 SN: 100264 SN: 100265 SN: 5058 (20k) SN: 5047.2/ 06327 SN: 7348 SN: 601 ID # SN: GB37480704 SN: US37292783 SN: MY41042517 SN: 100872 SN: US37280585 | 04-Apr-17 (No. 217-02521/02522) 04-Apr-17 (No. 217-02521) 01-Apr-17 (No. 217-02522) 07-Apr-17 (No. 217-02528) 07-Apr-17 (No. 217-02528) 31-Dec-16 (No. EX3-7349, Dec-16) 28-Mar-17 (No. DAE-4-501, Mar 17) Check Date (in house) 07-Det-15 (in house check Oct-16) 07-Det-15 (in house check Oct-16) 15-Jun-15 (in house check Oct-16) 19-Oct-01 (in house check Oct-16) | Apr-18 Apr-18 Apr-18 Apr-18 Apr-18 Dec-17 Mor-18 Schedulod Check In house check: Oct-18 |
| Power mater NRIP Power sensor NRIP-281 Power sensor NRIP-281 Relavances 20 dB Attenuator Type-N mismatch combination Reference Probe EXSOV4 DAE4 Secondary Standards Power mater EPM-442A Power sensor HP 8481A Power sensor HP 8481A RF generator P&S SMT-06 | SN: 104778 SN: 103244 SN: 103245 SN: 5058 (20k) SN: 50547.2/103327 SN: 7348 SN: 601 ID # SN: G837480704 SN: US37292783 SN: MY41092317 SN: 100972 SN: US37380585 Name | 04-Apr-17 (No. 217-02521/02522) 04-Apr-17 (No. 217-02521) 04-Apr-17 (No. 217-02522) 07-Apr-17 (No. 217-02528) 07-Apr-17 (No. 217-02529) 31-Dec-16 (N | Apr-18 Apr-18 Apr-18 Apr-18 Apr-18 Dec-17 Mor-18 Schedulod Check In house check: Oct-18 |

Certificate No: D2450V2-727_Apr17

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Calibration Laboratory of

Schmid & Partner Engineering AG Zeughausstrasse 43, 8004 Zurich, Switzerland





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Accreditation No.: SCS 0108

Swinn Calibration Service

Accreelled by the Swise Accreditation Service (SAS)

The Swize Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration pertificates

Glossary:

TSL ConvF N/A

tissue simulating liquid

sensitivity in TSL / NORM x,y,z not applicable or not measured

Calibration is Performed According to the Following Standards:

- a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques*, June 2013
- b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)*, February 2005
- c) IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)1, March 2010
- d) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

e) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

- Measurement Conditions: Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- Antenna Parameters with TSL: The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- Feed Point Impedance and Return Loss: These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required,
- Electrical Delay: One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- SAR measured: SAR measured at the stated antenna input power.
- SAR normalized: SAR as measured, normalized to an input power of 1 W at the antenna connector.
- SAR for nominal TSL parameters: The measured TSL parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

Certificate Not D2450V2-T27 April 7

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Measurement Conditions

| DASY Version | DA\$Y5 | V52.10.0 |
|------------------------------|------------------------|-------------|
| Extrapolation | Advanced Extrapolation | |
| Phantom | Modular Flat Phantom | |
| Distance Dipole Center - TSL | 10 mm | with Spacer |
| Zoom Scan Resolution | dx, dy, dz = 5 mm | |
| Frequency | 2450 MHz ± 1 MHz | |

Head TSL parameters

and coloulations were applied

| | Temperature | Permittivity | Conductivity |
|---|-----------------|--------------|------------------|
| Nominal Head TSL parameters | 22.0 °C | 39.2 | 1.80 mho/m |
| Measured Head TSL parameters | (22.0 ± 0.2) °C | 37.7 ± 6 % | 1.87 mho/m ± 6 % |
| Head TSL temperature change during test | < 0.5 °C | | |

SAR result with Head TSL

| SAR averaged over 1 cm ² (1 g) of Head TSL | Condition | |
|---|--------------------|--------------------------|
| SAR measured | 250 mW input power | 13.4 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | 52.2 W/kg ± 17.0 % (k=2) |

| SAR averaged over 10 cm ³ (10 g) of Head TSL | condition | |
|---|--------------------|--------------------------|
| SAR measured | 250 mW input power | 6.18 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | 24.3 W/kg ± 16.5 % (k=2) |

Body TSL parameters

ng parameters and calculations were applied.

| | Temperature | Permittivity | Conductivity |
|---|-----------------|--------------|------------------|
| Nominal Body TSL parameters | 22.0 °C | 52.7 | 1.95 mho/m |
| Measured Body TSL parameters | (22.0 ± 0.2) °C | 52.5 ± 6 % | 2.03 mha/m ± 6 % |
| Body TSL temperature change during test | < 0.5 °C | | |

SAR result with Body TSL

| SAR averaged over 1 cm3 (1 g) of Body TSL | Condition | |
|---|--------------------|--------------------------|
| SAR measured | 250 mW input power | 12.9 W/kg |
| SAR for nominal Body TSL parameters | normalized to 1W | 50.6 W/kg ± 17.0 % (k=2) |

| SAR averaged over 10 cm ³ (10 g) of Body TSL | condition | |
|---|--------------------|--------------------------|
| SAR measured | 250 mW input power | 6.01 W/kg |
| SAR for nominal Body TSL parameters | normalized to 1W | 23.8 W/kg ± 16.5 % (k=2) |

Certificate No: D2450V2-727 Apr17

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Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL

| Impedance, transformed to feed point | 56.3 Ω + 2.1 jΩ |
|--------------------------------------|-----------------|
| Return Loss | - 24.0 dB |

Antenna Parameters with Body TSL

| Impedance, | transformed to feed point | 51.1 Ω + 4.1 jΩ |
|-------------|---------------------------|-----------------|
| Return Loss | • | - 27.5 dB |

General Antenna Parameters and Design

| Electrical Delay (one direction) | 1.148 ns |
|----------------------------------|----------|
|----------------------------------|----------|

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipote is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipote. The antenna is therefore short-circuited for DC-signals. On some of the dipotes, small end caps are added to the dipote arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipote length is still according to the Standard.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

| | Manufactured by | SPEAG |
|---|-----------------|------------------|
| - | Manufactured on | January 09, 2003 |

Certificate No: D2450V2-727_Apr17 Page 4 of 8

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only. 除非只有铅明,供据华廷田摄影测验之样只有含,同时供接见属是例如于。大规华主领大公司事面纯可,不可可以通剩。

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DASY5 Validation Report for Head TSL

Date: 21.04.2017

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 727

Communication System: UID 0 - CW; Frequency: 2450 MHz

Medium parameters used: f = 2450 MHz; $\sigma = 1.87 \text{ S/m}$; $\varepsilon_r = 37.7$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

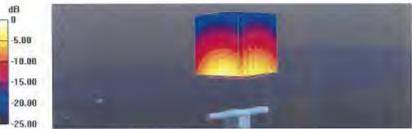
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 SN7349; ConvF(7.72, 7.72, 7.72); Calibrated: 31.12.2016;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 28.03.2017
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001
- DASY52 52,10.0(1442); SEMCAD X 14.6.10(7413)

Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm Reference Value = 109.8 V/m; Power Drift = -0.06 dB Peak SAR (extrapolated) = 27.3 W/kg SAR(1 g) = 13.4 W/kg; SAR(10 g) = 6.18 W/kgMaximum value of SAR (measured) = 21.1 W/kg



0 dB = 21.1 W/kg = 13.24 dBW/kg

Certificate No: D2450V2-727_Apr17

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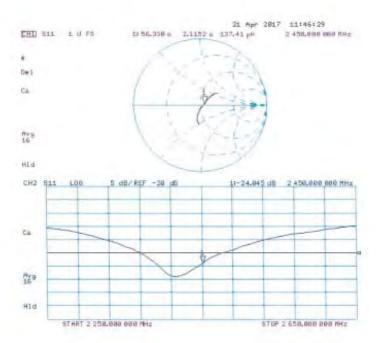
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Impedance Measurement Plot for Head TSL



Certificate No: D2450V2-727_Apr17

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DASY5 Validation Report for Body TSL

Date: 21.04.2017

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2450 MHz; Type; D2450V2; Serial: D2450V2 - SN: 727

Communication System: UID 0 - CW; Frequency: 2450 MHz

Medium parameters used: f = 2450 MHz; $\sigma = 2.03 \text{ S/m}$; $\epsilon_1 = 52.5$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 SN7349; ConvF(7.79, 7.79, 7.79); Calibrated: 31.12,2016;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 28.03.2017
- Phantom: Flat Phantom 5.0 (back); Type: QD 000 P50 AA; Serial: 1002
- DASY52 52.10.0(1442); SEMCAD X 14.6.10(7413)

Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 105.0 V/m; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 25.4 W/kg

SAR(1 g) = 12.9 W/kg; SAR(10 g) = 6.01 W/kg

Maximum value of SAR (measured) = 20.0 W/kg



0 dB = 20.0 W/kg = 13.01 dBW/kg

Certificate No: D2450V2-727_April7

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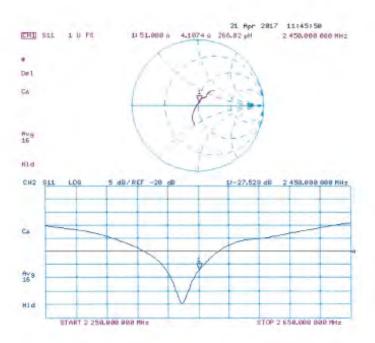
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Impedance Measurement Plot for Body TSL



Certificate No: D2450V2-727_Apr17

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Calibration Laboratory of

Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurtch, Switzerland





S Schweizerischer Kallbrundjerd
C Service suisse d'étalomage
S service svizzero di teratura
S Swiss Calibration Service

Accreditation No.: SCS 0108

Accredited by the Swiss Accreditation Service (SAS)

The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of collection coefficients

Glossary:

ConvF

N/A

tissue simulating liquid

sensitivity in TSL / NORM x,y,z not applicable or not measured

Calibration is Performed According to the Following Standards:

- a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
- EC 62209-1, "Measurement procedure for the assessment of Specific Absorption Rate (SAR) from hand-held and body-mounted devices used next to the ear (frequency range of 300 MHz to 6 GHz)", July 2018
- EC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)". March 2010
- d) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

e) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

- Measurement Conditions: Further details are available from the Validation Report at the end
 of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- Antenna Parameters with TSL: The dipole is mounted with the spacer to position its feed
 point exactly below the center marking of the flat phantom section, with the arms oriented
 parallel to the body axis.
- Feed Point Impedance and Return Loss: These parameters are measured with the dipole
 positioned under the liquid filled phantom. The impedance stated is transformed from the
 measurement at the SMA connector to the feed point. The Return Loss ensures low
 reflected power. No uncertainty required.
- Electrical Delay: One-way delay between the SMA connector and the antenna feed point.
 No uncertainty required.
- SAR measured: SAR measured at the stated antenna input power.
- SAR normalized: SAR as measured, normalized to an input power of 1 W at the antenna connector.
- SAR for nominal TSL parameters: The measured TSL parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

Certificate No: 02450V2-727_April 8

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Measurement Conditions

| DASY Version | DASYS | V52.10.0 |
|------------------------------|------------------------|-------------|
| Extrapolation | Advanced Extrapolation | |
| Phantom | Modular Flat Phantom | |
| Distance Dipole Center - TSL | 10 mm | with Spacer |
| Zoom Scan Resolution | dx, dy, dz. = 5 mm | |
| Frequency | 2450 MHz = 1 MHz | |
| | | |

Head TSL parameters

The following parameters and calculations were applied.

| | Temperature | Permittivity | Conductivity |
|---|-----------------|--------------|------------------|
| Nominal Head TSL parameters | 22.0 °C | 39.2 | 1.80 mho/m |
| Measured Head TSL parameters | (22.0 ± 0.2) °C | 38.3 ± 6 % | 1.86 mho/m ± 6 % |
| Head TSL temperature change during test | < 0.5 °C | _ | |

SAR result with Head TSL

| SAR averaged over 1 cm ⁵ (1 g) of Head TSL | Condition | |
|---|--------------------|--------------------------|
| SAR measured | 250 mW input power | 13,3 W/kg |
| SAR for nominal Head TSL parameters | Wt of begilamon | 52.1 W/kg ± 17.0 % (k=2) |

| SAR averaged over 10 cm3 (10 g) of Head TSL | condition | |
|---|--------------------|--------------------------|
| SAR measured | 250 mW Input power | 8.16.W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | 24.3 W/kg ± 16.5 % (k=2) |

Body TSL parameters

| | Temperature | Permittivity | Conductivity |
|---|-----------------|--------------|-------------------|
| Nominal Body TSL parameters | 22.0 °C | 52.7 | 1.95 mho/m |
| Measured Body TSL parameters | (22.0 ± 0.2) °C | 52.5 ± 6 % | 2.01 mho/m = € %. |
| Body TSL temperature change during test | < 0,5.°C | _ | |

SAR result with Body TSL

| SAR sveraged over 1 cm ¹ (1 g) of Body TSL | Condition | |
|---|--------------------|--------------------------|
| SAR measured | 250 mW input power | 12.9 W/kg |
| SAR for nominal Body TSL parameters | normalized to 1W | 50.8 W/kg ± 17.0 % (k=2) |

| SAR averaged over 10 cm ³ (10 g) of Body TSL | condition | |
|---|--------------------|--------------------------|
| SAR measured | 250 mW input power | 6.00 W/kg |
| SAR for nominal Body TSL parameters | normalized to 1W | 23.8 W/kg ± 16.5 % (k=2) |

Certificate No: D2450V2-727_Apr18

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Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL

| Impedance, transformed to feed point | $55.2 \Omega + 2.7 J\Omega$ |
|--------------------------------------|-----------------------------|
| Heturn Loss | = 25.1 dB |

Antenna Parameters with Body TSL

| Impledance, transformed to feed point | 51.2 (2 + 5.8)(2 | |
|---------------------------------------|-------------------|--|
| Return Loss | - 25.0 dB | |

General Antenna Parameters and Design

| Electrical Delay (one direction) | 1.149 ns | |
|----------------------------------|----------|--|
|----------------------------------|----------|--|

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semingid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end cage. are added to the dipole arms in order to improve matching when loaded according to the position as explained in the

"Measurement Conditions" paragraph. The SAFI data are not affected by this change. The overall dipole length is still according to the Standard.

No excessive force must be applied to the dipole emis, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

| Manufactured by | SPEAG | |
|-----------------|------------------|--|
| Manufactured on | January 09, 2003 | |

Certificate No: D2450V2-727_Aprile

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DASY5 Validation Report for Head TSL

Date: 24.04.2018

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN:727

Communication System: UID 0 - CW; Frequency: 2450 MHz

Medium parameters used: f = 2450 MHz; $\sigma = 1.86 \text{ S/m}$; $\epsilon_t = 38.3$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

dB -5.00 -10.00 -15.00 -20.00 25.00

- Probe: EX3DV4 SN7349; ConvF(7.88, 7.88, 7.88); Calibrated: 30.12.2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 26.10.2017
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001
- DASY52 52.10.0(1446); SEMCAD X 14.6.10(7417)

Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid; dx=5mm, dy=5mm, dz=5mm Reference Value = 116.0 V/m; Power Drift = -0.06 dB Peak SAR (extrapolated) = 26.7 W/kg

SAR(1 g) = 13.3 W/kg; SAR(10 g) = 6.16 W/kgMaximum value of SAR (measured) = 22.0 W/kg





0 dB = 22.0 W/kg = 13.42 dBW/kg

Certificate No: D2450V2-727_April8

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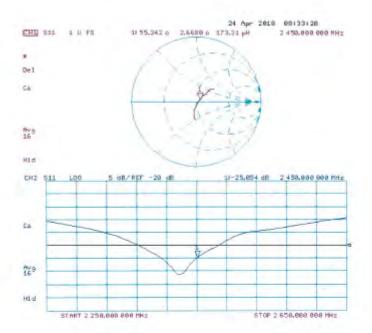
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Impedance Measurement Plot for Head TSL



Certificate No: D2450V2-727_Apr18

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DASY5 Validation Report for Body TSL

Date: 24.04.2018

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN:727

Communication System: UID 0 - CW; Frequency: 2450 MHz.

Medium parameters used: f = 2450 MHz; $\sigma = 2.01 \text{ S/m}$; $\varepsilon_r = 52.5$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

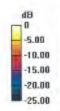
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

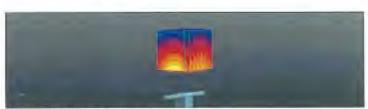
DASY52 Configuration:

- Probe: EX3DV4 SN7349; ConvF(8.01, 8.01, 8.01); Calibrated: 30.12.2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 26.10.2017
- Phantom: Flat Phantom 5.0 (back); Type: QD 000 P50 AA; Serial: 1002
- DASY52 52.10.0(1446); SEMCAD X 14.6.10(7417)

Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm Reference Value = 108.4 V/m; Power Drift = -0.07 dB Peak SAR (extrapolated) = 25.5 W/kg SAR(1 g) = 12.9 W/kg; SAR(10 g) = 6 W/kgMaximum value of SAR (measured) = 21.1 W/kg





0 dB = 21.1 W/kg = 13.24 dBW/kg

Certificate No: D2450V2-727, April 8

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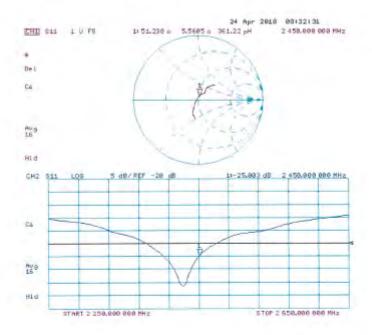
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Impedance Measurement Plot for Body TSL



Certificate No: D2450V2-727_Apr18

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Calibration Laboratory of Schmid & Partner

Engineering AG Zeughausstrasse 43, 8004 Zurich, Switzerland





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- Servizio avizzero di taratura S Swiss Calibration Service

Accreditation No.: SCS 0108

Accredited by the Swiss Accreditation Service (SAS) The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

SGS-TW (Auden)

Certificate No: D5GHzV2-1023 Jan17

| Object | D5GHzV2 - SN:1 | 023 | |
|--|--|---|--|
| Caribration pricedure(s) | QA CAL-22.v2 Calibration proce | dure for dipole validation kits betw | veen 3-6 GHz |
| Calibration date: | January 20, 2017 | | |
| This calibration portificate documents. The mississements and the unce | entii the traceability to nati rtainties with confidence p | onal standards, which realize the physical um rehability are given on the hillowing pages an | ts of measurements (SI). clars part of the certificate |
| All calibrations have been conduc | cted in the closed aborato | y łacińy, anwronmont temperature $(22\pm3)^{\circ}$ C | and humidity < 70%. |
| Calibration Equipment used (M&) | TE ortical for calibration) | | |
| Primary Standards | 10 # | Cal Date [Certificate No.] | Schedilled Calibration |
| Power meter NRP | SN: 104778 | 06-Apr-16 (No. 217-02289/02289) | Apr-17 |
| Power sensor NRP-Z91 | SNL 103244 | 06-Apr-16 (No. 217-02288) | Apr-17 |
| | SN 103245 | 06-Apr-16 (No. 217-02289) | Apr-17 |
| ower sensor NRP-Z91 | | | |
| | SN: 5058 (20k) | 85-Apr-16 (No. 217-02292) | Apr-17 |
| Reference 20 dB Attenuator | The Court of the C | 05-Apr-16 (No. 217-02202) 05-Apr-16 (No. 217-02295) | Apr-17 |
| Reference 20 dB Attenuator Type-N internatch combination | SN: 5058 (20k) | 05-Apr-16 (No. 217-02392) 05-Apr-16 (No. 217-02295) 31-Dec-16 (No. EXS-8508_Dec-16) | Apr-17 Dec-17 |
| Reference 20 dB Atlanuator Type-N mismatch combination Reference Probe EX3DV4 | SN: 5058 (20k) SN: 5047.2 / 06327 | 05-Apr-16 (No. 217-02202) 05-Apr-16 (No. 217-02295) | Apr-17 |
| Reference 20 dB Attenuator Type-N internation combination Reference Probe EX3DV4 DAE4 | SN: 5058 (20k) SN: 5047.2 / 06327 SN: 3503 | 05-Apr-16 (No. 217-02392) 05-Apr-16 (No. 217-02295) 31-Dec-16 (No. EXS-8508_Dec16) | Apr-17 Dec-17 |
| Reference 20 dB Attenuator Type-N mismatch combination Reference Probe EX30V4 DAE4 Secondary Stanzants | SN: 5058 (204) SN: 5047.2 / 06327 SN: 3503 SN: 601 | 05-Apr-16 (No. 217-02302) 05-Apr-16 (No. 217-02285) 31-Dec-16 (No. EXS-9503 Dec-15) 04-Jen-17 (No. DAE4-601 Jan17) | Apr-17 Dec-17 Jan-18 |
| Reference 20 dB Attenuator Type-N mismatch combination Reference Probe EX30V4 DAE4 Secondary Stanzants | SN: 5058 (204) SN: 5047.2 / 06327 SN: 3603 SN: 801 | 05-Apr-16 (No. 217-02302) 05-Apr-16 (No. 217-02295) 31-Dec-16 (No. EXS-9503_Dec-16) 04-Jen-17 (No. DAE4-901_Jen17) Check Date (in house) | Apr-17 Dec-17 Jan-18 Scheoules Check |
| Reference 20 dB Attenuator Type-N internatch combination Reference Probe EX30V4 DAE4 Secondary Stancards Power inser EPM-442A | SN: 5088 (20k) SN: 5047.2 / 06327 SN: 3609 SN: 801 | 05-Apr-16 (No. 217-02302) 05-Apr-16 (No. 217-02305) 31-Dec-16 (No. EXS-0303_Dec15) 04-Jen-17 (No. DAE4-601_Jan17) Check Date (in house) 07-Oct-16 (in house) | Agr-17 Dec-17 Jan-18 Schedulet Check In house check Cot-18 In house check Cot-18 In house check Cot-18 |
| Reference 20 dB Attenuator Type-9 internation combination Fisherance Probe EX3DV4 DAE4 Secondary Standards Power more EPM-442A Power sensor HP 9481A Power sensor HP 8481A | SN: 5056 (204) SN: 5047 2 / 06327 SN: 3609 SN: 601 ID 8 SN: 6897480704 SN: US37282789 | 05-Apr-16 (No. 217-0292) 05-Apr-16 (No. 217-0296) 31-Dec-16 (No. EXS-9503, Dec-16) 04-Jen-17 (No. DAE4-601, Jan17) Check Date (in house) 07-Oct-16 (in house check Oct-16) 07-Oct-15 (in house check Oct-16) | Apr-17 Dec-17 Jan-18 Schedulet Check In Fours check Dot-18 In house check Dot-18 In house check Dot-19 In house check Dot-19 In house check Dot-19 |
| Reference 20 dB Attenuator Type-N mismatch combination Reference Probe EX30V4 DAE4 Secondary Standards Power sensor HP 8481A Power sensor HP 8481A RF generator R&S SMT-08 | SN: 5050 (20k) SN: 5047 2 / 06327 SN: 3603 SN: 601 ID 8 SN: GB97480704 SN: US37292789 SN: MY41092317 | 05-Apr-16 (No. 217-02302) 05-Apr-16 (No. 217-02285) 31-Dec-16 (No. EXE-6503 Dec-16) 04-Jen-17 (No. DAE4-601_Jan17) Chock Date (In house) 07-Oct-15 (in house check Oct-16) 07-Oct-15 (in house check Oct-16) 07-Oct-15 (in house check Oct-16) | Agr-17 Dec-17 Jan-18 Schedulet Check In house check Cot-18 In house check Cot-18 In house check Cot-18 |
| Reference 20 dB Attenuator Type-N internation combination Reference Probe EX30V4 DAE4 Secondary Stanzants Power maker EPM-442A Power sonsor HP 8481A | SN: 5086 (20k) SN: 5047 2 / 96327 SN: 3609 SN: 801 SN: 6837480704 SN: US37292789 SN: MY41092317 SN: 100972 SN: US37390565 | 05-Apr-16 (No. 217-02302) 05-Apr-16 (No. 217-02295) 31-Dec-16 (No. DSS-9503 Dec-16) 04-Jen-17 (No. DAE4-601_Jan17) Check Date (in house) 07-Oct-16 (in house check Oct-16) 07-Oct-15 (in house check Oct-16) 15-Jun-15 (in house check Oct-16) | Apr-17 Dec-17 Jan-18 Schedulet Check In Fouse check Cot-18 In house check Cot-18 In house check Cot-18 In house check Cot-18 |
| Reference 20 dB Attenuator Type-N mismatch combination Reference Probe EX30V4 DAE4 Secondary Stancards Power meter EPM-442A Power sensor HP 8481A Power sensor HP 8481A RF generator R&S SMT-08 Network Analyzer HP 8753E | SN: 5050 (20k) SN: 5047 2 / 06327 SN: 3603 SN: 601 SN: 6087480704 SN: 0897480704 SN: US37292789 SN: MY41092317 SN: 100972 SN: US37390585 | 05-Apr-16 (No. 217-02302) 05-Apr-16 (No. 217-02295) 31-Dec-16 (No. EXS-0503, Dec-16) 04-Jen-17 (No. DAE4-601, Jan17) Check Date (in house) 07-Oct-15 (in house check Oct-16) 07-Oct-15 (in house check Oct-16) 15-Jun-15 (in house check Oct-16) 15-Jun-15 (in house check Oct-16) 15-Jun-15 (in house check Oct-16) | Apr-17 Dec-17 Jan-18 Schedulet Check In house check: Dch-18 In house check: Cch-18 |
| Power meer EPM-442A Power sensor HP 8481A Power sensor HP 8481A RF generalin R&S SMT-00 | SN: 5086 (20k) SN: 5047 2 / 96327 SN: 3609 SN: 801 SN: 6837480704 SN: US37292789 SN: MY41092317 SN: 100972 SN: US37390565 | 05-Apr-16 (No. 217-02302) 05-Apr-16 (No. 217-02285) 31-Dec-16 (No. EXE-6503 Dec-16) 04-Jen-17 (No. DAE4-601_Jan17) Chock Date (In house) 07-Oct-16 (in house check Oct-16) 07-Oct-15 (in house check Oct-16) 15-Jun-15 (in house check Oct-16) 15-Jun-15 (in house check Oct-16) 15-Jun-15 (in house check Oct-16) | Apr-17 Dec-17 Jan-18 Schedulet Check In house check: Dot-18 In house check: Cot-18 In house check: Cot-18 In house check: Cot-18 In house check: Cot-18 |
| Reference 20 dB Attenuator Type-N mismatch combination Reference Probe EX30V4 DAE4 Secondary Stanzands Power reser EPM-442A Power sensor HP 8481A Power sensor HP 8481A RE generator R&S SMT-0B Network Analyzer HP 8753E Cellented by | SN: 5086 (204) SN: 5047 2 / 06327 SN: 3609 SN: 801 SN: 6897480704 SN: US37282780 SN: MY4 1082317 SN: US37280585 Name Jecon Kastrati | 05-Apr-16 (No. 217-02302) 05-Apr-16 (No. 217-02305) 91-Dec-16 (No. 217-02305) 94-Jen-17 (No. DAE4-691_Jen17) Check Date (in house) 07-Oct-16 (in house check Oct-16) 07-Oct-15 (in house check Oct-16) 15-Jun-15 (in house check Oct-16) Function Laccratory Technician | Apr-17 Dec-17 Jan-18 Schedulet Check In house check: Dch-18 In house check: Cch-18 |
| Reference 20 dB Attenuator Type-N mismatch combination Reference Probe EX30V4 DAE4 Secondary Stancards Power meter EPM-442A Power sensor HP 8481A Power sensor HP 8481A RF generator R&S SMT-08 Network Analyzer HP 8753E | SN: 5050 (20k) SN: 5047 2 / 06327 SN: 3603 SN: 601 SN: 6087480704 SN: 0897480704 SN: US37292789 SN: MY41092317 SN: 100972 SN: US37390585 | 05-Apr-16 (No. 217-02302) 05-Apr-16 (No. 217-02285) 31-Dec-16 (No. EXE-6503 Dec-16) 04-Jen-17 (No. DAE4-601_Jan17) Chock Date (In house) 07-Oct-16 (in house check Oct-16) 07-Oct-15 (in house check Oct-16) 15-Jun-15 (in house check Oct-16) 15-Jun-15 (in house check Oct-16) 15-Jun-15 (in house check Oct-16) | Apr-17 Dec-17 Jan-18 Scheduled Check In house check: Dch-18 In house check: Cch-18 In house check: Cch-18 In house check: Cch-18 In house check: Cch-18 |

Certificate No: D5GHzV2-1023_Jan17

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Calibration Laboratory of Schmid & Panner Engineering AG Zeugriniumstrawer #1, 8004 Zurich, Switzerland





Service sulese critalernage Servicio avizzavo di tavatura Swiss Calibertion Service

Accreditation No.: SCS 0108

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Glossary:

tissue simulating liquid sensitivity in TSL / NORM x.y.z. TSL ConvF N/A not applicable or not measured

Calibration is Performed According to the Following Standards:

- a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Pask Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices Measurement Techniques*, June 2013
- IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010
- b) KDB 865664; 'SAR Measurement Requirements for 100 MHz to 6 GHz'

Additional Documentation:

d) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

- Measurement Conditions: Further details are available from the Validation Report at the end of the cartilicate. All figures stated in the certificate are valid at the frequency indicated.
- Antenna Parameters with TSL: The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- Fixed Point Impedance and Return Loss: These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- Electrical Delay: One-way delay between the SMA connector and the antenna feed point. No uncortainty required.
- SAR measured: SAR measured at the stated antenna input power.
- SAR normalized: SAR as measured, normalized to an input power of 1 W at the antenna
- SAR for nominal TSL parameters: The measured TSL parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

Derthicate No: D5GHz/V2 (023 Jan17)

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Measurement Conditions

n configuration, as far as not given on page 1

| DASY Version | DASYS | V52.8.8 |
|------------------------------|--|----------------------------------|
| Extrapolation | Advanced Extrapolation | |
| Phantom | Modular Flat Phantom V5.0 | |
| Distance Dipole Center - TSL | 10 mm | with Spacer |
| Zoom Scan Resolution | dx, dy = 4,0 mm, dz = 1.4 mm | Graded Ratio = 1.4 (Z direction) |
| Frequency | 5200 MHz ± 1 MHz 5300 MHz ± 1 MHz 5600 MHz ± 1 MHz 5600 MHz ± 1 MHz | |

Head TSL parameters at 5200 MHz

| | Temperature | Permittivity | Conductivity |
|---|-----------------|--------------|------------------|
| Nominal Head TSL parameters | 22.0 °C | 38.0 | 4.66 mhp/m |
| Measured Head TSL parameters | (22.0 ± 0.2) °C | 35.4 ± 6 % | 4.45 mho/m ± 6.% |
| Hend TSL temperature change during test | <05℃ | | - |

SAR result with Head TSL at 5200 MHz

| SAR averaged over 1 cm3 (1 g) of Head TSL | Condition | |
|---|--------------------|--------------------------|
| SAR meresured | 100 mW input power | 7.55 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | 75.2 W/kg ± 19.9 % (k=2) |

| SAR averaged over 10 cm3 (10 g) of Head TSL | condition | |
|---|--------------------|--------------------------|
| SAR measured | 100 mW input power | 2.16 W/kg |
| SARI for nominal Head TSL parameters | normalized to 1W | 21.5 W/kg ± 19.5 % (k=2) |

Certificate No: D5GHzV2-1023_Jan17

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Head TSL parameters at 5300 MHz

| | Temperature | Permittivity | Conductivity |
|---|-----------------|--------------|------------------|
| Nominal Head TSL parameters | 22.0 °C | 35.9 | 4.76 mho/m |
| Measured Head TSL parameters | (22.0 ± 0.2) °C | 35,2 ± 6 % | 4.55 mho/m ± 6 % |
| Head TSL temperature change during test | < 0.5 °C | | |

SAR result with Head TSL at 5300 MHz

| SAR averaged over 1 cm ³ (1 g) of Head TSL | Condition | |
|---|--------------------|----------------------------|
| SAR measured | 100 mW input power | 8.22 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | 81.8 W / kg ± 19.9 % (k=2) |

| SAR averaged over 10 cm ³ (10 g) of Head TSL | condition | |
|---|--------------------|--------------------------|
| SAR measured | 100 mW input power | 2.35 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | 23.3 W/kg ± 19.5 % (k=2) |

Head TSL parameters at 5600 MHz

| | Temperature | Permittivity | Conductivity |
|---|-----------------|--------------|------------------|
| Nominal Head TSL parameters | 22.0 °C | 35.5 | 5.07 mho/m |
| Measured Head TSL parameters | (22.0 ± 0.2) °C | 347 # 6% | 4.85 mho/m ± 6 % |
| Head TSL temperature change during test | < 0.5°C | - | 100 |

SAR result with Head TSL at 5600 MHz

| SAR averaged over 1 cm3 (1 g) of Head TSL | Condition | |
|---|--------------------|--------------------------|
| SAR measured | 100 mW input power | 8.22 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | 81.7 W/kg ± 19.9 % (k=2) |

| SAR averaged over 10 cm2 (10 g) of Head TSL | condition | |
|---|--------------------|--------------------------|
| SAR measured | 100 mW Input power | 2.33 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | 23.1 W/kg ± 19.5 % (k=2) |

Certificate No: D5GHzV2-1023_Jan17

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Head TSL parameters at 5800 MHz

| | Temperature | Permittivity | Conductivity |
|---|-----------------|--------------|------------------|
| Nominal Head TSL parameters | 22.0 °C | 35.3 | 5.27 mho/m |
| Measured Head TSL parameters | (22.0 ± 0.2) °C | 34 4 ± 6 % | 5 05 mho/m ± 6 % |
| Head TSL temperature change during test | < 0.5 °C | - | _ |

SAR result with Head TSL at 5800 MHz

| SAR averaged over 1 cm ² (1 g) of Head TSL | Condition | |
|---|--------------------|--------------------------|
| SAR measured | 100 mW input power | 7.82 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | 77.6 W/kg ± 19.9 % (k=2) |

| SAR averaged over 10 cm2 (10 g) of Head TSL | condition | |
|---|--------------------|--------------------------|
| SAR measured | 100 mW input powr≋ | .2.22 W/kg |
| SAR for nominal Head TSL parameters. | normalized to 1W | 22.0 W/kg ± 19.5 % (k=2) |

Gertificate No: D5GHzV2-1025_Jan17

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Body TSL parameters at 5200 MHz

| | Temperature | Permittivity | Conductivity |
|---|-----------------|--------------|------------------|
| Nominal Body TSL parameters | 22.0 0 | 49.0 | 5,30 mha/m |
| Measured Body TSL parameters | (22.0 ± 0.2) °C | 47.5 ± 6 % | 5.36 mho/m ± 6 % |
| Body TSL temperature change during test | ≥0.5 ℃ | | _ |

SAR result with Body TSL at 5200 MHz

| SAR averaged over 1 cm ³ (1 g) of Body TSL | Condition | |
|---|--------------------|--------------------------|
| SAR measured | 100 mW input power | 7,32 W/kg |
| SAR for nominal Body TSL parameters | normalized to 1W | 72.8 W/kg ± 19.9 % (k=2) |

| SAR averaged over 10 cm2 (10 g) of Body TSL | condition | |
|---|--------------------|--------------------------|
| SAR measured | 100 mW input power | 2.05 W/kg |
| SAR for nominal Body TSL parameters. | normalized to 1W | 20.3 W/kg ± 19.5 % (k=2) |

Body TSL parameters at 5300 MHz

| | Temperature | Permittivity | Conductivity |
|---|-----------------|--------------|------------------|
| Nominal Body TSL parameters | 22.0 °C | 48.9 | 5.42 mho/m |
| Measured Body TSL parameters | (22.0 ± 0.2) °C | 47.3±6% | 5,50 mho/m ± 6 % |
| Body TSL temperature change during test | < 0.5 °C | -400 | - |

SAR result with Body TSL at 5300 MHz

| SAR averaged over 1 cm2 (1 g) of Body TSL | Condition | |
|---|--------------------|--------------------------|
| SAR measured | 100 mW input power | 7.68 W/kg |
| SAR for nominal Bedy TSL parameters | normalized to 1W | 76.1 W/kg ± 19.9 % (k=2) |

| SAR averaged over 10 cm2 (10 g) of Body TSL | condition | |
|---|--------------------|--------------------------|
| SAR measured | 100 mW input power | 2.15 W/kg |
| SAR for nominal Body TSL parameters | normalized to 1V/ | 21.3 W/kg = 19.5 % (k=2) |

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Body TSL parameters at 5600 MHz

| | Temperature | Permittivity | Conductivity |
|---|-----------------|--------------|------------------|
| Nominal Body TSL parameters | 22.0 °C | 48.5 | 5.77 mha/m |
| Measured Body TSL parameters | (22.0 ± 0.2) °C | 46.5 ± 6 % | 5.90 mho/m ± 6 % |
| Body TSL temperature change during test | < 0.5 ℃ | _ | |

SAR result with Body TSL at 5600 MHz

| SAR averaged over 1 cm ³ (1 g) of Body TSL. | Condition | |
|--|--------------------|--------------------------|
| SAR measured | 100 mW input power | 8.02 W/kg |
| SAR for nominal Body TSL parameters | normalized to 1W | 79.6 W/kg ± 19.9 % (k=2) |

| SAR averaged over 10 cm2 (10 g) of Body TSL | condition | |
|---|----------------------|--------------------------|
| SAR measured | 100 I'MV input power | 2.26 W/kg |
| SAR for nominal Body TSL parameters | normalized to 1W | 22.4 W/kg ± 19.5 % (k=2) |

Body TSL parameters at 5800 MHz

| | Temperature | Permittivity | Conductivity |
|---|-----------------|--------------|------------------|
| Nominal Body TSL parameters | 22.0 °C | 48.2 | 6,00 mho/m |
| Measured Body TSL parameters | (22.0 ± 0.2) °C | 48.3 ± 6 % | 6.17 mho/m ± 6 % |
| Body TSL temperature change during test | < 0.5 °C | - | - |

SAR result with Body TSL at 5800 MHz

| SAR averaged over 1 cm2 (1 g) of Body TSL | Condition | |
|---|--------------------|--------------------------|
| SAR measured | 100 mW Input power | 7.64 W/kg |
| SAR for nominal Body TSL parameters | normalized to 1W | 75.9 W/kg ± 19.9 % (k=2) |

| SAR averaged over 10 cm ³ (10 g) of Body TSL | condition | |
|---|--------------------|--------------------------|
| SAF massured | 100 mW input power | 2.13 W/kg |
| SAR for nominal Body TSL parameters | normalized to 1W | 21.1 W/kg ± 19.5 % (k=2) |

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Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL at 5200 MHz

| Impedance, transformed to feed point | 49.6 Ω · 6.7 Ω | |
|--------------------------------------|-----------------|--|
| Return Loss | - 23,4 dB | |

Antenna Parameters with Head TSL at 5300 MHz

| Impedance, transformed to feed point | 49.0 Ω - 1.8 jΩ | |
|--------------------------------------|-----------------|--|
| Return Loss | +33.5 dB | |

Antenna Parameters with Head TSL at 5600 MHz

| Impediancs, transformed to feed point | 54.1 Ω − 0.2 jΩ |
|---------------------------------------|-----------------|
| Fleturn Loss | - 28.2 dB |

Antenna Parameters with Head TSL at 5800 MHz

| Impedance, transformed to feed point | 55.4 \(\Omega + 2.8 \(\Omega \) | |
|--------------------------------------|-----------------------------------|--|
| Fletum Loss | -24.8 dB | |

Antenna Parameters with Body TSL at 5200 MHz

| Impedance, transformed to feed point | 48.9 Ω - 7.0 jΩ |
|--------------------------------------|-----------------|
| Return Loss | - 22.9 dB |

Antenna Parameters with Body TSL at 5300 MHz

| Impedance, transformed to feed point | 51.0 Ω - 1.0 Ω | |
|--------------------------------------|-----------------|--|
| Return Loss | - 37.0 dB | |

Antenna Parameters with Body TSL at 5600 MHz

| Impedance, transformed to feed point | 55.6 Ω + 1.5 βΩ | |
|--------------------------------------|-----------------|--|
| Return Loss | - 25.2 dB | |

Antenna Parameters with Body TSL at 5800 MHz

| Impedance, transformed to feed point | 56.6 Ω + 2.7 Ω | |
|--------------------------------------|------------------------------|--|
| Return Loss | = 23.6 dB | |

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General Antenna Parameters and Design

| Electrical Delay (one direction) | 1.199 ns |
|----------------------------------|----------|

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

| Manufactured by | SPEAG | |
|-----------------|-------------------|--|
| Manufactured on | February 05, 2004 | |

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DASY5 Validation Report for Head TSL

Date: 20.01.2017

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole D5GHzV2; Type: D5GHzV2; Serial: D5GHzV2 - SN:1023

Communication System: UID 0 - CW;

Frequency: 5200 MHz, Frequency: 5300 MHz, Frequency: 5600 MHz, Frequency: 5800 MHz

Medium parameters used: f = 5200 MHz; $\alpha = 4.45$ S/m; $\epsilon_c = 35.4$; $\rho = 1000$ kg/m

Medium parameters used: l = 5300 MHz; $\sigma = 4.55 \text{ S/m}$; $\tilde{\epsilon}_s = 35.2$; $\rho = 1000 \text{ kg/m}^3$.

Medium parameters used: l = 5600 MHz; n = 4.85 S/m; $\epsilon_r = 34.7$; $\rho = 1000 \text{ kg/m}^2$.

Medium parameters used: f = 5800 MHz: $\pi = 5.05$ S/m; $\varepsilon_t = 34.4$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63, 19-2011)

DASY52 Configuration:

- Probe: EX3DV4 SN3503; ConvF(5.76, 5.76, 5.76); Calibrated: 31.12.2016, ConvF(5.35, 5.35, 5,35); Calibrated. 31.12.2016, ConvF(5.09, 5.09, 5.09); Calibrated: 31.12.2016, ConvF(5.0). 5.01. 5.01); Calibrated: 31.12.2016;
- Sensor-Surface: L4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.01.2017
- Phantom: Flut Phuntom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7372)

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5200 MHz/Zoom Scan.

dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 70.58 V/m; Power Drift = -0.08 dB

Peak SAR (extrapolated) = 27.6 W/kg

SAR(1 g) = 7.55 W/kg; SAR(10 g) = 2.16 W/kg

Maximum value of SAR (measured) = 17.4 W/kg

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5300 MHz/Zoom Scan,

dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 73.01 V/m; Power Drift = -0.05 dB

Peak SAR (extrapolated) = 31,6 W/kg

SAR(1 g) = 8.22 W/kg; SAR(10 g) = 2.35 W/kg

Maximum value of SAR (measured) = 19.3 W/kg.

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5600 MHz/Zoom Scan,

dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 71.94 V/m; Power Drift = -0.04 dB

Peak SAR (extrapolated) = 33.2 W/kg

SAR(1 g) = 8.22 W/kg; SAR(10 g) = 2.33 W/kg

Maximum value of SAR (measured) = 19.8 W/kg

Cemticate No: 05GHzV2-1023_Jan17.

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Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5800 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 69.84 V/m; Power Drift = -0.08 dB

Peak SAR (extrapolated) = 32.7 W/kg

SAR(1 g) = 7.82 W/kg; SAR(10 g) = 2.22 W/kg

Maximum value of SAR (measured) = 19.5 W/kg.



0 dB = 17.4 W/kg = 12.41 dBW/kg

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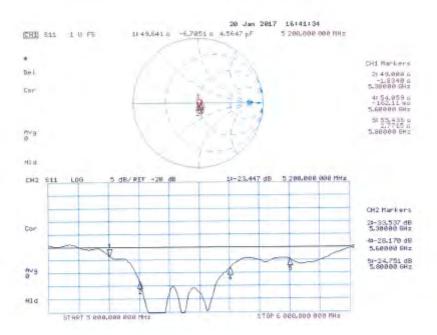
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Impedance Measurement Plot for Head TSL



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DASY5 Validation Report for Body TSL

Date: 19.01.2017

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole D5GHzV2; Type: D5GHzV2; Serial: D5GHzV2 - SN:1023

Communication System: UID 0 - CW;

Frequency: 5200 MHz, Frequency: 5300 MHz, Prequency: 5600 MHz, Frequency: 5800 MHz

Medium parameters used: f = 5200 MHz; $\sigma = 5.36$ S/m; $\varepsilon_r = 47.5$; $\rho = 1000$ kg/m

Medium parameters used: f = 5300 MHz; $\sigma = 5.5 \text{ S/m}$; $\varepsilon_i = 47.3$; $\rho = 1000 \text{ kg/m}^3$

Medium parameters used: f = 5600 MHz; $\sigma = 5.9 \text{ S/m}$; $\epsilon_i = 46.6$; $\rho = 1000 \text{ kg/m}$

Medium parameters used: f = 5800 MHz; $\sigma = 6.17 \text{ S/m}$; $\epsilon_r = 46.3$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard; DASY5 (IEEE/IEC/ANSI C63,19-2011)

DASY52 Configuration:

- Probe: EX3DV4 SN3503; ConvF(5,29, 5,29, 5,29); Calibrated: 31 12.2016; ConvF(5.04, 5,04. 5.04); Calibrated: 31.12.2016, ConvF(4.57, 4.57; A.57); Calibrated. 31.12.2016, ConvF(4.48, 4.48; 4.48); Calibrated: 31.12.2016;
- · Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electromes: DAE4 Sn601, Calibrated: 04.01.2017
- Phantom: Flat Phantom 5,0 (back); Type: QD 000 P50 AA; Serial: 1002
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7372)

Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5200 MHz/Zoom Scan,

dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 65.54 V/m; Power Drift = 0.06 dB

Peak SAR (extrapolated) = 28.1 W/kg

SAR(1 g) = 7.32 W/kg; SAR(10 g) = 2.05 W/kg

Maximum value of SAR (measured) = 16.6 W/kg

Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5300 MHz/Zoom Scan,

dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1,4mm

Reference Value = 66.93 V/m; Power Drift = -0.07 dB

Penk SAR (extrapolated) = 30.1 W/kg

SAR(1 g) = 7.66 W/kg; SAR(10 g) = 2.15 W/kg

Maximum value of SAR (measured) = 17.6 W/kg

Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5600 MHz/Zoom Scan,

dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 67.09 V/m; Power Drift = 0.07 dB

Peak SAR (extrapolated) = 33.7 W/kg

SAR(1 g) = 8.02 W/kg; SAR(10 g) = 2.26 W/kg

Maximum value of SAR (measured) = 18.9 W/kg

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Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5800 MHz/Zoom Scan,

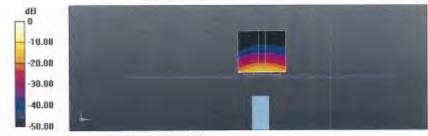
dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 65.14 V/m; Power Drift = -0.06 dB

Peak SAR (extrapolated) = 34.0 W/kg

SAR(1 g) = 7.64 W/kg; SAR(10 g) = 2.13 W/kg

Maximum value of SAR (measured) = 18.3 W/kg



0 dB = 16.6 W/kg = 12.20 dBW/kg

Certificate No: D5GHzV2-1023_Jan17

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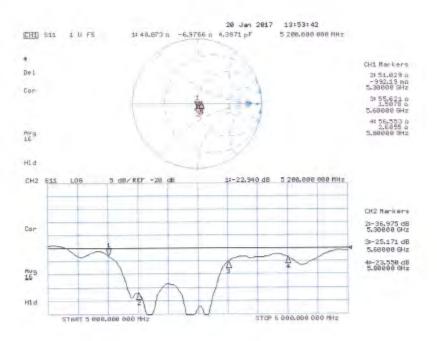
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Impedance Measurement Plot for Body TSL



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Calibration Laboratory of Schmid & Partner Engineering AG Zaughausstrasse 43, 8004 Zurich, Switzerland





Schweizerischer Kalibrierdienst Service suisse d'étalonnage C Servizio avizzero di teratura S Swiss Calibration Service

Appreditation No.: SCS 0108

Accredited by the Swiss Accreditation Service (SAS) The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

SGS.TW (Auden)

Certificate No: D5GHzV2-1023 Jan18

| Dejdo | D5GHzV2 - SN:1 | 023 | |
|--|---|--|--|
| Celibration procedure(s) | QA CAL-22.v2 Calibration proce | dure for dipole validation kits betw | ween 3-6 GHz |
| alibration date: | January 25, 2018 | 1 | |
| | | onal standards, which realize the physical uni robability are given on the following pages an | |
| | | ry facility, environment temperatura (22 \pm 3)°C | and framidity < 70%. |
| Calibration Equipment used (M&T | F critical for calibrations | | |
| | V | a Ventura and an exist. | |
| Primery Standards | ID # | Cal Date (Certificate No.) | Scheduled Calibration |
| Primery Standards | 1D # EN: 104778 | 04-Apr-17 (No. 217-02521/02522) | Apr-18 |
| Primery Standards Power moter NRP Power sensor NRP-291 | ID # EN: 104778 SN: 106244 | 04-Apr-17 (No. 217-02521/02522) 04-Apr-17 (No. 217-02521) | Apr-18 Apr-18 |
| Primery Standards Power moter NRP Power sensor NRP-291 Power sensor NRP-291 | ID # EN: 104779 SN: 108244 SN: 103246 | 04-Apr-17 (No. 217-02521/02522) 04-Apr-17 (No. 217-02521) 04-Apr-17 (No. 217-02522) | Apr-18 Apr-18 Apr-18 |
| Primery Standards Power residen NRP Power sensor NRP-Z91 Power sensor NRP-Z91 Reference 20 dB Attenuator | ID # EN: 104779 SN: 105244 SN: 103246 SN: 5058 (20k) | 04-Apr-17 (No. 217-02521/02522) 04-Apr-17 (No. 217-02521) 04-Apr-17 (No. 217-02522) 07-Apr-17 (No. 217-02528) | Apr-18 Apr-18 Apr-18 Apr-18 |
| Primary Standards Primary Standards Primary Sansar NEP-291 Power sensor NEP-291 Refeasance 20 dB Attenuator Type-N mismatch combination | ID # EN: 104779 SN: 105544 SN: 103545 SN: 5058 (20k) SN: 5047.2 / 06327 | 04-Apr-17 (No. 217-02521/02522) 04-Apr-17 (No. 217-02521) 04-Apr-17 (No. 217-02522) 07-Apr-17 (No. 217-02528) 07-Apr-17 (No. 217-02528) | Apr-18 Apr-18 Apr-18 |
| Primery Standards Power maler NRP Power sensor NRP-291 Power sensor NRP-291 | ID # EN: 104779 SN: 105244 SN: 103246 SN: 5058 (20k) | 04-Apr-17 (No. 217-02521/02522) 04-Apr-17 (No. 217-02521) 04-Apr-17 (No. 217-02522) 07-Apr-17 (No. 217-02528) | Apr-18 Apr-18 Apr-18 Apr-18 Apr-18 |
| Primary Standards Power maler NPP Power sensor NRP-291 Power sensor NRP-291 Reference 20 dB Attenuator Type-N mismatch combination Reference Probe EX3DV4 | ID 8 EN: 104778 SN: 105284 GN: 105284 SN: 5068 (20k) SN: 5047.2 / 06327 SN: 5047.2 / 06327 SN: 601 | 04-Apr-17 (No. 217-02521) 04-Apr-17 (No. 217-02521) 04-Apr-17 (No. 217-02522) 07-Apr-17 (No. 217-02528) 07-Apr-17 (No. 217-02528) 07-Apr-17 (No. 217-02529) 30-Dec-17 (No. EX3-3503_Dec17) 26-Oct-17 (No. DAE4-801_Oct17) Check Date (in house) | Apr-18 Apr-18 Apr-16 Apr-16 Apr-16 Dec-18 Oct-18 |
| Primary Standards Power meter NPP Provin sensor NRP-Z91 Power sensor NRP-Z91 Reference 20 dB Attenuator Type-N mismatch combination Reference Probe EX3DV4 DAE4 Secondary Standards Power meter EPM-442A | ID 8 EN: 104778 SN: 105544 SN: 105545 SN: 5056 (20k) SN: 5047 2 / 06377 SN: 3505 SN: 601 ID # SN: G837480704 | 04-Apr-17 (No. 217-02521) 04-Apr-17 (No. 217-02521) 04-Apr-17 (No. 217-02522) 07-Apr-17 (No. 217-02528) 07-Apr-17 (No. 217-02528) 09-Dec-17 (No. EX3-3503_Dec17) 26-Oct-17 (No. DAE4-601_Oct17) Check Date (in house) 07-Oct-15 (in house chack Oct-16) | Apr-18 Apr-18 Apr-16 Apr-16 Apr-16 Dec-18 Oct-18 Scheduled Check In house check: Oct-18 |
| Primary Standards Power meter NPP Priver sensor NRP-Z91 Power sensor NRP-Z91 Reference 20 dB Attenuator Type-N mismatch combination Reference Probe EX3DV4 DAE4 Secondary Standards Power meter EPM-442A Power meter EPM-442A | ID # EN: 104779 SN: 105244 SN: 105245 SN: 5056 (20k) SN: 5047 2 / 06327 SN: 3503 SN: 601 ID # SN: G837460704 SN: US37292783 | 04-Apr-17 (No. 217-02521(02522) 04-Apr-17 (No. 217-02521) 04-Apr-17 (No. 217-02521) 07-Apr-17 (No. 217-02529) 07-Apr-17 (No. 217-02529) 30-Dec-17 (No. 217-02529) 30-Dec-17 (No. E)3-3503_Dec17) 26-Oct-17 (No. DAE4-601_Oct17) Check Date (in house) 07-Oct-15 (in house check Oct-16) 07-Oct-15 (in house check Oct-16) | Apr-18 Apr-18 Apr-18 Apr-18 Apr-18 Dec-18 Oct-18 Scheduled Oneck In house check: Oct-18 In house check: Oct-18 |
| Primary Standards Power meter NPP Power sensor NRP-291 Power sensor NRP-291 Reference 20 dB Attenuator Type-N mismatich combination Reference Probe EX3DV4 DAE4 Secondary Standards Power meter EPM-442A Power sensor HP 8481A Power sensor HP 8481A | ID # EN: 104779 EN: 103244 SN: 103245 SN: 5058 (204) SN: 5047 2 / 06327 SN: 3503 SN: 601 ID # SN: GS37480704 SN: US37282783 BN: MY41092317 | 04-Apr-17 (No. 217-02521) 04-Apr-17 (No. 217-02521) 04-Apr-17 (No. 217-02521) 04-Apr-17 (No. 217-02529) 07-Apr-17 (No. 217-02529) 30-Dec-17 (No. 217-02529) 30-Dec-17 (No. 217-02529) 30-Dec-17 (No. DAE4-601_Oct17) Check Date (in house) 07-Oct-15 (in house check Oct-16) 07-Oct-15 (in house check Oct-16) 07-Oct-15 (in house check Oct-16) | Apr-18 Apr-18 Apr-18 Apr-18 Apr-18 Apr-18 Dec-18 Oct-18 Scheduled Offeck In house check: Oct-18 In house check: Oct-18 In house check: Oct-18 |
| Primery Standards Power resider NRP Power sensor NRP-Z91 Power sensor NRP-Z91 Reference 20 dB Attenuator Type-N mismatch combination Reference Probe EX3DV4 DAE4 Secondary Standards Power meter EPM-442A Power sensor HP 8481A Power sensor HP 8481A Proper sensor HP 8481A | ID # EN: 104778 SN: 105254 SN: 105254 SN: 5058 (20k) SN: 5047 2 / 05327 SN: 3503 SN: 601 ID # SN: GB37480704 SN: US37282783 SN: MY41882317 SN: 100672 | 04-Apr-17 (No. 217-02521) 04-Apr-17 (No. 217-02521) 04-Apr-17 (No. 217-02521) 04-Apr-17 (No. 217-02529) 07-Apr-17 (No. 217-02529) 07-Apr-17 (No. 217-02529) 30-Dec-17 (No. 217-02529) 30-Dec-17 (No. 287-3503_Dec-17) 26-Oct-17 (No. DAE4-601_Oct17) Check Date (in house) 07-Oct-15 (in house check Oct-16) 07-Oct-15 (in house check Oct-16) 07-Oct-15 (in house check Oct-16) | Apr-18 Apr-18 Apr-18 Apr-18 Apr-18 Apr-18 Apr-18 Oct-18 Oct-18 Scheduled Oheck In house check: Oct-18 In house check: Oct-18 In house check: Oct-18 In house check: Oct-18 |
| Primary Standards Power meter NPP Power sensor NRP-291 Power sensor NRP-291 Reference 20 dB Attenuator Type-N mismatich combination Reference Probe EX3DV4 DAE4 Secondary Standards Power meter EPM-442A Power sensor HP 8481A Power sensor HP 8481A | ID # EN: 104779 EN: 103244 SN: 103245 SN: 5058 (204) SN: 5047 2 / 06327 SN: 3503 SN: 601 ID # SN: GS37480704 SN: US37282783 BN: MY41092317 | 04-Apr-17 (No. 217-02521) 04-Apr-17 (No. 217-02521) 04-Apr-17 (No. 217-02521) 04-Apr-17 (No. 217-02529) 07-Apr-17 (No. 217-02529) 30-Dec-17 (No. 217-02529) 30-Dec-17 (No. 217-02529) 30-Dec-17 (No. DAE4-601_Oct17) Check Date (in house) 07-Oct-15 (in house check Oct-16) 07-Oct-15 (in house check Oct-16) 07-Oct-15 (in house check Oct-16) | Apr-18 Apr-18 Apr-18 Apr-18 Apr-18 Apr-18 Dec-18 Oct-18 Scheduled Offeck In house check: Oct-18 In house check: Oct-18 In house check: Oct-18 |
| Primary Standards Power Instell NPP Prowin sensor NRP-Z91 Power sensor NRP-Z91 Reference 20 dB Attenuator Type-N mismatch combination Reference Probe EX3DV4 DAE4 Secondary Standards Power motor EPM-442A Power motor EPM-441A Power sensor HP 8481A Power sensor HP 8461A RF generator R&S SMT-66 Network Arwityzer HP 8753E | ID # EN: 104778 SN: 103544 SN: 103545 SN: 5056 (20k) SN: 5047 2 / 06327 SN: 3503 SN: 601 ID # SN: GB37480704 SN: US37282783 SN: MY4192317 SN: 100672 SN: US37380606 | 04-Apr-17 (No. 217-02521(02522) 04-Apr-17 (No. 217-02521) 04-Apr-17 (No. 217-02521) 07-Apr-17 (No. 217-02529) 07-Apr-17 (No. 217-02529) 30-Dec-17 (No. 217-02529) 30-Dec-17 (No. 23-3503_Dec17) 26-Oct-17 (No. DAE4-601_Oct17) Check Date (in house) 07-Oct-15 (in house check Oct-16) 07-Oct-15 (in house check Oct-16) 16-Oct-15 (in house check Oct-17) Function | Apr-18 Apr-18 Apr-18 Apr-18 Apr-18 Apr-18 Apr-18 Oct-18 Oct-18 Scheduled Oheck In house check: Oct-18 In house check: Oct-18 In house check: Oct-18 In house check: Oct-18 |
| Primery Standards Power resider NRP Power sensor NRP-Z91 Power sensor NRP-Z91 Reference 20 dB Attenuator Type-N mismatch combination Reference Probe EX3DV4 DAE4 Secondary Standards Power meter EPM-442A Power sensor HP 8481A Power sensor HP 8481A Proper sensor HP 8481A | ID 8 BN: 104778 SN: 105544 SN: 105545 SN: 5056 (20k) SN: 5047 2 / 06377 SN: 5007 SN: 601 ID # SN: GB37480704 SN: US37288783 SN: MY41082317 SN: 906972 SN: US37380606 | 04-Apr-17 (No. 217-02521(02522) 04-Apr-17 (No. 217-02521) 04-Apr-17 (No. 217-02521) 07-Apr-17 (No. 217-02529) 07-Apr-17 (No. 217-02529) 30-Dec-17 (No. 217-02529) 30-Dec-17 (No. 23-3503_Dec17) 26-Oct-17 (No. DAE4-601_Oct17) Check Date (in house) 07-Oct-15 (in house check Oct-16) 07-Oct-15 (in house check Oct-16) 07-Oct-15 (in house check Oct-16) 15-Jun-15 (in house check Oct-16) 18-Oct-01 (in house check Oct-17) | Apr-18 Apr-18 Apr-18 Apr-18 Apr-18 Dec-18 Oct-18 Scheduled Check In house check: Oct-18 |

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Calibration Laboratory of Schmid & Partner

Engineering AG Zeughausstrasse 43, 8004 Zurich. Switzerland





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C Service subse d'étalonnage
Servizio svizzero di taratura
S Swiss Calibration Service

Accreditation No.: SCS 0108

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Multilateral Agreement for the recognition of calibration certificates

Glossary:

TSL tissue simulating liquid
ConvF sensitivity in TSL / NORM x,y,z
N/A not applicable or not measured

Calibration is Performed According to the Following Standards:

- a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
- EC 62209-1, "Measurement procedure for the assessment of Specific Absorption Rate (SAR) from hand-held and body-mounted devices used next to the ear (frequency range of 300 MHz to 6 GHz)", July 2016
- IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)". March 2010
- d) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

e) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

- Measurement Conditions: Further details are available from the Validation Report at the end
 of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- Antenna Parameters with TSL: The dipole is mounted with the spacer to position its feed
 point exactly below the center marking of the flat phantom section, with the arms oriented
 parallel to the body axis.
- Feed Point Impedance and Return Loss: These parameters are measured with the dipole
 positioned under the liquid filled phantom. The impedance stated is transformed from the
 measurement at the SMA connector to the feed point. The Return Loss ensures low
 reflected power. No uncertainty required.
- Electrical Delay: One-way delay between the SMA connector and the antenna feed point.
 No uncertainty required.
- SAR measured: SAR measured at the stated antenna input power.
- SAR normalized: SAR as measured, normalized to an input power of 1 W at the antenna connector.
- SAR for nominal TSL parameters: The measured TSL parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

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Measurement Conditions

DASY system configuration, as far as not given on page 1.

| DASY Version | DASY5 | V52,10.0 |
|------------------------------|--|----------------------------------|
| Extrapolation | Advanced Extrapolation | |
| Phantom | Modular Flat Phantom V5.0 | |
| Distance Dipole Center - TSL | 10 mm | With Spacer |
| Zoom Scan Resolution | dx, dy = 4.0 mm, dz = 1,4 mm | Graded Ratio = 1.4 (Z direction) |
| Frequency | 5200 MHz ± 1 MHz 5300 MHz ± 1 MHz 5600 MHz ± 1 MHz 5800 MHz ± 1 MHz | |

Head TSL parameters at 5200 MHz

The following parameters and calculations were applied.

| | Temperature | Permittivity | Conductivity |
|---|-----------------|--------------|------------------|
| Nominal Head TSL parameters | 22,0 °C | 38.0 | 4.66 mho/m |
| Measured Head TSL parameters | (22.0 ± 0.2) °C | 36.3 ± 6 % | 4.50 mha/m ± 6 % |
| Head TSL temperature change during lest | €0.5 °C | per: | 1000 |

SAR result with Head TSL at 5200 MHz

| SAR averaged over 1 cm2 (1 g) of Head TSL | Condition | |
|---|--------------------|--------------------------|
| SAR measured | 100 mW input power | 7:72 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | 77.3 W/kg ± 19.9 % (k=2) |

| SAR averaged over 10 cm ³ (10 g) of Head TSL | condition | | |
|---|--------------------|--------------------------|--|
| SAR measured | 100 mW input power | 2.22 W/kg | |
| SAR for nominal Head TSL parameters | normalized to 1W | 22.2 W/kg ± 19.5 % (k=2) | |

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Head TSL parameters at 5300 MHz

The following parameters and calculations were applied.

| | Temperature | Permittivity | Conductivity |
|---|-----------------|--------------|------------------|
| Nominal Head TSL parameters | 22.0 °C | 35.9 | 4.76 mho/m |
| Measured Head TSL parameters | (22.0 ± 0.2) °C | 35.2 ± 6 % | 4.60 mho/m ± 6 % |
| Head TSL temperature change during test | < 0.5 °C | - | - |

SAR result with Head TSL at 5300 MHz

| SAR averaged over 1 cm ⁹ (1 g) of Head TSL | Condition | |
|---|--------------------|----------------------------|
| SAR measured | 100 mW input power | 8.09 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | 80.9 W / kg ± 19.9 % (k=2) |

| SAR averaged over 10 cm3 (10 g) of Head TSL | condition | |
|---|--------------------|--------------------------|
| SAR measured | 100 mW input power | 2.32 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | 23.2 W/kg ± 19.5 % (k=2) |

Head TSL parameters at 5600 MHz

| | Temperature | Permittivity | Conductivity |
|---|-----------------|--------------|------------------|
| Nominal Head TSL parameters | 22,0 ℃ | 35.5 | 5.07 mho/m |
| Measured Head TSL parameters | (22.0 ± 0.2) °C | 35.8 ± 6 % | 4.90 mha/m ± 6 % |
| Head TSL temperature change during test | < 0.5°C | | + |

SAR result with Head TSL at 5600 MHz

| SAR averaged over 1 cm3 (1 g) of Head TSL | Condition | |
|---|--------------------|--------------------------|
| SAR measured | 100 mW input power | B.19 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | 81.9 W/kg ± 19.9 % (k=2) |

| SAR averaged over 10 cm ² (10 g) of Head TSL | condition | |
|---|--------------------|--------------------------|
| SAR measured | 100 mW input power | 2.34 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | 23.4 W/kg ± 19.5 % (k=2) |

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Head TSL parameters at 5800 MHz

The following parameters and calculations were applied.

| | Temperature | Permittivity | Conductivity |
|---|-----------------|--------------|------------------|
| Nominal Head TSL parameters | 22.0 °C | 35.3 | 5.27 mho/m |
| Measured Head TSL parameters | (22.0 ± 0.2) °C | 35.5 ± 6 % | 5.11 mho/m ± 8 % |
| Head TSL temperature change during test | < 0.5 °C | (tank) | - |

SAR result with Head TSL at 5800 MHz

| SAR averaged over 1 cm2 (1 g) of Head TSL | Condition | |
|---|--------------------|--------------------------|
| SAR measured | 100 mW Input power | 7.90 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | 79.0 W/kg ± 19.9 % (k=2) |

| SAR averaged over 10 cm3 (10 g) of Head TSL | condition | |
|---|--------------------|--------------------------|
| SAR measured | 100 mW input power | 2,25 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | 22.5 W/kg ± 19.5 % (k=2) |

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Body TSL parameters at 5200 MHz

meters and calculations were applied.

| | Temperature | Permittivity | Conductivity |
|---|-----------------|--------------|------------------|
| Nominal Body TSL parameters | 22.0 °C | 49.0 | 5.30 mho/m |
| Measured Body TSL parameters | (22.0 ± 0.2) °C | 47.3±6% | 5,41 mho/m ± 6 % |
| Body TSL temperature change during test | < 0.5 °C | - | - |

SAR result with Body TSL at 5200 MHz

| SAR averaged over 1 cm3 (1 g) of Body TSL | Condition | |
|---|--------------------|--------------------------|
| SAR measured | 100 mW input power | 7.14 W/kg |
| SAR for nominal Body TSL parameters | normalized to 1W | 70.5 W/kg ± 19.9 % (k=2) |

| SAR averaged over 10 cm² (10 g) of Body TSL | condition | |
|---|--------------------|--------------------------|
| SAR measured | 100 mW input power | 2.00 W/kg |
| SAR for nominal Body TSL parameters | normalized to fW | 19.8 W/kg ± 19.5 % (k=2) |

Body TSL parameters at 5300 MHz

ing parameters and calculations were applied.

| | Temperature | Permittivity | Conductivity |
|---|-----------------|--------------|------------------|
| Nominal Body TSL parameters | 22.0 °C | 48.9 | 5.42 mho/m |
| Measured Body TSL parameters | (22.0 ± 0.2) °C | 47 1 ± 6 % | 5.54 mho/m = 6 % |
| Body TSL temperature change during test | < 0,5 °C | - | - O-V |

SAR result with Body TSL at 5300 MHz

| SAR averaged over 1 cm3 (1 g) of Body TSL | Condition | |
|---|--------------------|--------------------------|
| SAR measured | 100 mW Input power | 7.34 W/kg |
| SAR for nominal Body TSL parameters | normalized to 1W | 72.9 W/kg ± 19.9 % (k=2) |

| SAR averaged over 10 cm ³ (10 g) of Body TSL | condition | |
|---|--------------------|--------------------------|
| SAR measured | 100 mW input power | 2.06 W/kg |
| SAR for nominal Body TSL parameters | normalized to 1W | 20.4 W/kg ± 19.5 % (k=2) |

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Body TSL parameters at 5600 MHz

| | Temperature | Permittivity | Conductivity |
|---|-----------------|--------------|------------------|
| Nominal Body TSL parameters | 22.0 °C | 48.5 | 5.77 mho/m |
| Measured Body TSL parameters | (22.0 ± 0.2) °C | 45.6 ± 6 % | 5.94 mha/m ± 6 % |
| Body TSL temperature change during test | < 0.5 °C | - med | |

SAR result with Body TSL at 5600 MHz

| SAR averaged over 1 cm3 (1 g) of Body TSL | Condition | |
|---|--------------------|--------------------------|
| SAR measured | 100 mW input power | 7.81 W/kg |
| SAR for nominal Body TSL parameters | normalized to 1W | 77,6 W/kg ± 19,9 % (k=2) |

| SAR averaged over 10 cm ³ (10 g) of Body TSL | condition | |
|---|--------------------|--------------------------|
| SAR measured | 100 mW input power | 2.19 W/kg |
| SAFI for nominal Body TSL parameters | normalized to 1W | 21.7 W/kg = 19.5 % (k=2) |

Body TSL parameters at 5800 MHz

| | Temperature | Permittivity | Conductivity |
|---|-----------------|--------------|------------------|
| Nominal Body TSL parameters | 22.0 °C | 48.2 | 6.00 mholm |
| Measured Body TSL parameters | (22.0 ± 0.2) °C | 48.2 ± 6 % | 6.22 mha/m ± 6 % |
| Body TSL temperature change during test | < 0.5 °C | _ | |

SAR result with Body TSL at 5800 MHz

| SAR averaged over 1 cm3 (1 g) of Body TSL | Condition | |
|---|--------------------|--------------------------|
| SAR measured | 100 mW input power | 7.46 W/kg |
| SAR for nominal Body TSL parameters | normalized to 1W | 74.1 W/kg ± 19.9 % (k=2) |

| SAR averaged over 10 cm ² (10 g) of Body TSL | condition | |
|---|--------------------|--------------------------|
| SAR measured | 100 mW input power | 2.07 W/kg |
| SAR for nominal Body TSL parameters | normalized to 1W | 20.5 W/kg ± 19.5 % (k=2) |

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Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL at 5200 MHz

| Impedance, transformed to feed point | 50.1 Ω - 8.1 jΩ |
|--------------------------------------|-----------------|
| Return Loss | - 21.9 dB |

Antenna Parameters with Head TSL at 5300 MHz

| Impedance, transformed to feed point | 50.5 Ω - 2.3 Ω |
|--------------------------------------|-----------------|
| Return Loss | - 32.7 dB |

Antenna Parameters with Head TSL at 5600 MHz

| Impedance, transformed to feed point | 53.9 Ω - 0.7 Ω | |
|--------------------------------------|-----------------|--|
| Return Loss | - 28.4 dB | |

Antenna Parameters with Head TSL at 5800 MHz

| Impedance, transformed to feed point | 55.3 Ω + 2.6 jΩ |
|--------------------------------------|-----------------|
| Heturn Loss | - 25.1 dB |

Antenna Parameters with Body TSL at 5200 MHz

| Impedance, transformed to feed point | 49.8 Ω - 6.9 jΩ. |
|--------------------------------------|------------------|
| Court A. Court | - 23.2 dB |
| Return Loss | And the Arts |

Antenna Parameters with Body TSL at 5300 MHz

| Impedance, transformed to leed point | 50.9 Ω - 0.9 jΩ |
|--------------------------------------|-----------------|
| Return Loss | - 37.9 dB |

Antenna Parameters with Body TSL at 5600 MHz

| Impedance, transformed to feed point | 56.0 Ω + 0.5 JΩ |
|--------------------------------------|-----------------|
| Return Loss | - 24.9 dB |

Antenna Parameters with Body TSL at 5800 MHz

| Impedance, transformed to leed point | 56.6 \(\Omega + 2.3 \) (2 |
|--------------------------------------|----------------------------|
| Return Loss | → 23,7 dB |

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General Antenna Parameters and Design

| Electrical Delay (one direction) | 1:199 ns |
|--|----------|
| The state of the s | |

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard,

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

| Manufactured by | SPEAG | |
|-----------------|-------------------|--|
| Manufactured on | February 05, 2004 | |

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DASY5 Validation Report for Head TSL

Date: 25.01.2018

Test Laboratory; SPEAG, Zurich, Switzerland

DUT: Dipole D5GHzV2; Type: D5GHzV2; Serial: D5GHzV2 - SN:1023

Communication System: UID () - CW/ Frequency: 5200 MHz, Frequency: 5300 MHz, Frequency: 5600 MHz,

Frequency: 5800 MHz

Medium parameters used: f = 5200 MHz; $\sigma = 4.5 \text{ S/m}$; $\epsilon_r = 36.3$; $\rho = 1000 \text{ kg/m}^3$. Medium parameters used: f = 5300 MHz; $\sigma = 4.6 \text{ S/m}$; $\epsilon_r = 36.2$; $\rho = 1000 \text{ kg/m}^3$.

Medium parameters used: i = 5600 MHz; $\sigma = 4.9$ S/m; $\epsilon_r = 35.8$; $\rho = 1000$ kg/m

Medium parameters used: f = 5800 MHz; $\sigma = 5.11$ S/m; $a_t = 35.5$; $\rho = 1000$ kg/m²

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: BX3DV4 SN3503; ConvF(5.75, 5.75, 5.75); Calibrated: 30.12,2017, ConvF(5.5, 5.5, 5.5); Calibrated: 30.12.2017, ConvF(5.05, 5.05, 5.05); Calibrated: 30.12.2017, ConvF(4.96, 4.96, 4.96); Calibrated: 30.12.2017;
- Sensor-Surface: 1.4mm (Mechanica) Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 26.10.2017
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001
- DASY52 52.10.0(1446); SEMCAD X 14.6.10(7417)

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5200 MHz/Zoom Scan, dist=1.4mm

(8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 70.47 V/m; Power Drift = -0.04 dB

Peak SAR (extrapolated) = 27.5 W/kg

SAR(1 g) = 7.72 W/kg; SAR(10 g) = 2.22 W/kg

Maximum value of SAR (measured) = 17.7 W/kg.

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5300 MHz/Zoom Scan, dist=1.4mm

(8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 74.63 V/m; Power Drift = -0.06 dB

Peak SAR (extrapolated) = 29.6 W/kg

SAR(1 g) = 8.09 W/kg; SAR(10 g) = 2.32 W/kg

Maximum value of SAR (measured) = 18.6 W/kg.

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5600 MHz/Zoom Scan, dist=1.4mm

(8x8x7)/Cube 0: Measurement grid; dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 70.79 V/m; Power Drift = -0.05 dB

Peak SAR (extrapolated) = 31.5 W/kg

SAR(1 g) = 8.19 W/kg; SAR(10 g) = 2.34 W/kg

Maximum value of SAR (measured) = 19.6 W/kg

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Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5800 MHz/Zoom Scan, dist=1.4mm

(8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 69.22 V/m; Power Drift = -0.05 dB

Peak SAR (extrapolated) = 31.2 W/kg

SAR(1 g) = 7.9 W/kg; SAR(10 g) = 2.25 W/kg

Maximum value of SAR (measured) = 19.0 W/kg



0 dB = 17.7 W/kg = 12.48 dBW/kg

Certificate No: D5GHzV2-1023_Jan18

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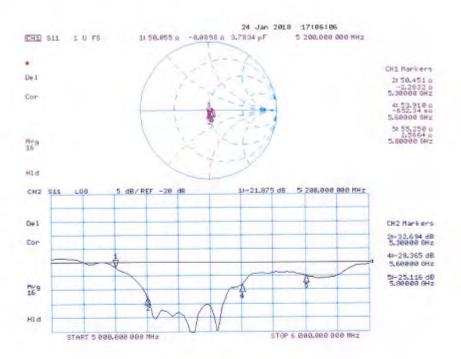
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Impedance Measurement Plot for Head TSL



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DASY5 Validation Report for Body TSL

Date: 23.01.2018

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole D5GHzV2; Type: D5GHzV2; Serial: D5GHzV2 - SN:1023

Communication System: UID 0 - CW; Frequency: 5200 MHz, Frequency: 5300 MHz, Frequency: 5600 MHz,

Frequency: 5800 MHz

Medium parameters used: f = 5200 MHz; $\sigma = 5.41 \text{ S/m}$; $\epsilon_c = 47.3$; $\rho = 1000 \text{ kg/m}^3$.

Medium parameters used: f = 5300 MHz; $\sigma = 5.54$ S/m; $\varepsilon_r = 47.1$; p = 1000 kg/m²

Medium parameters used: f = 5600 MHz; $\sigma = 5.94$ S/m; $\varepsilon_r = 46.6$; $\rho = 1000$ kg/m². Medium parameters used: f = 5800 MHz; $\sigma = 6.22 \text{ S/m}$; $\epsilon_r = 46.2$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 SN3503; ConvF(5,35, 5,35, 5,35); Calibrated: 30.12.2017. ConvF(5.15, 5.15, 5.15); Calibrated: 30.12.2017, ConvF(4.65, 4.65, 4.65); Calibrated: 30.12.2017, ConvF(4.53, 4.53, 4.53); Calibrated: 30.12.2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAFA Sn601; Calibrated: 26.10.2017
- Phantom: Flat Phantom 5.0 (back); Type: QD 000 P50 AA; Serial: 1002
- DASY52 52,10.0(1446); SEMCAD X 14.6.10(7417)

Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5200 MHz/Zoom Scan, dist=1.4mm

(8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 66.00 V/m; Power Drift = -0.05 dB

Peak SAR (extrapolated) = 26.4 W/kg

SAR(1 g) = 7.14 W/kg; SAR(10 g) = 2 W/kg

Maximum value of SAR (measured) = 16.8 W/kg

Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5300 MHz/Zoom Scan, dist=1.4mm

(8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1,4mm

Reference Value = 65.19 V/m; Power Drift = -0.06 dB

Peak SAR (extrapolated) = 28.4 W/kg

SAR(1g) - 7.34 W/kg; SAR(10g) = 2.06 W/kg

Maximum value of SAR (measured) = 17.6 W/kg

Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5600 MHz/Zoom Scan, dist=1.4mm

(8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 66.21 V/m; Power Drift = -0.09 dB

Peak SAR (extrapolated) = 32.8 W/kg

SAR(1 g) = 7.81 W/kg; SAR(10 g) = 2.19 W/kg

Maximum value of SAR (measured) = 19.1 W/kg

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Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5800 MHz/Zoom Scan, dist=1.4mm

(8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 64.05 V/m; Power Drift = -0.05 dB

Peak SAR (extrapolated) = 32.3 W/kg

SAR(1 g) = 7.46 W/kg; SAR(10 g) = 2.07 W/kg

Maximum value of SAR (measured) = 18.8 W/kg



0 dB = 18.8 W/kg = 12.74 dBW/kg

Certificate No: D5GHzV2-1023_Jan18

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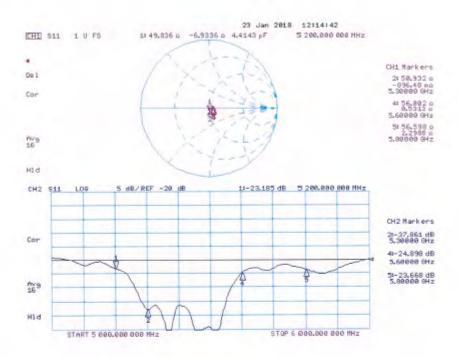
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Impedance Measurement Plot for Body TSL



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- End of report -

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